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Diagnosis of common lesions of the oral cavity

■ *Robert B. Shira, D.D.S., Washington, D. C.*

The members of the dental profession should be sufficiently skilled to make the proper diagnosis when confronted by conditions in the oral cavity that represent deviations from the normal. The dentist is a specialist in a very small field, working primarily within the confines of the oral cavity; familiarity with the common lesions found in this region is definitely within the realm of his capabilities.

Many types of lesions are encountered in the oral cavity, ranging from congenital abnormalities to true neoplasms. Some are common, others relatively rare. Some require treatment, whereas others are important only from a diagnostic standpoint. The clinical findings of some are so characteristic and constant that diagnosis can be made with certainty by the experienced clinician. In others the findings are so nonspecific that attempts to arrive at an accurate diagnosis from the clinical observations alone are speculative at best. The role of the histopathologic examination cannot be overemphasized in dealing with this latter group and should be employed in the diagnosis of any lesion in which the clinical findings are not specific. In discussing these lesions, it is obviously impossible to cover the entire field. Therefore, this article will be limited to the more common benign soft tissue lesions. These shall be arbitrarily divided into four general categories—those of congenital or developmental origin, those producing changes in the color, contour, and texture of the mucosa, those characterized by vesicle formation, and those resulting from tumorlike proliferations and true neoplasia. There will be some overlapping in this arbitrary division, of course, but it serves to furnish a practical approach to the problem.

■ *Lesions of Congenital and Developmental Origin*

Lesions of congenital and developmental origin are frequently encountered in the oral cavity. For the most part, they are asymptomatic and of little concern. When first discovered by the patient, how-

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Fig. 1—Fordyce's disease characterized by elevated, chamois colored, discrete lesions involving the mucosa of the cheek

ever, they are often responsible for alarm and on occasion result in considerable professional diagnostic speculation. Fordyce's disease, torus palatinus, double lip, lip pits, median rhomboid glossitis, and fissured tongue are the conditions that will be considered in this paper.

FORDYCE'S DISEASE—Fordyce's disease, or Fordyce's granules as they are sometimes called, is a common condition found in approximately four fifths[1] of the adult population. The granules consist of many aberrant sebaceous glands located on the mucosa of the mouth. Sebaceous glands are normally found as skin appendages associated with hair follicles. When they appear in the mouth as the result of a developmental anomaly, however, they present certain characteristics.[2] The most common site for them is the posterior portion of the buccal mucosa along the line of closure of the teeth, but they are also seen in the retromolar regions and on the mucosal surfaces of the lips. They consist of multiple, small, slightly elevated, discrete, yellowish-tan projections arranged in clusters on the mucosa (Fig. 1). They have a granular appearance and become much more prominent when the mucosa is stretched. The glands usually become hypertrophic, probably as the result of continued chronic irritative factors. The lesions, for the most part, are symptomless and are discovered accidentally or as the result of a thorough oral examination. They seldom require treatment and are important only from a diagnostic standpoint.

TORUS PALATINUS—Torus palatinus is a localized exostosis found in the midline of the posterior two thirds of the hard palate. It occurs in from 20[3] to 25[4] per cent of the adult population, and women are involved approximately twice as frequently as men. These exostoses are seldom seen in infants or young children, but start to develop about the time of puberty and grow slowly until young adult life when they become more or less stationary. Many people have well-developed tori without being aware of their existence and sometimes become alarmed and even develop a cancerphobia when the lesion is called to their attention. Physicians frequently become concerned when they discover these growths during a routine physical examination and often

1. Halperin, V., and others. Occurrence of Fordyce spots, benign migratory glossitis, median rhomboid glossitis, and fissured tongue in 2,478 dental patients. Oral Surg., Oral Med. & Oral Path. 6:1072 Sept. 1953.

2. Chambers, S. O. Structure of Fordyce's disease as demonstrated by wax reconstruction. Arch. Dermat. & Syph. 18:666 Nov. 1928.

3. Halperin, V., and others. Occurrence of torus palatinus and torus mandibularis in 2,478 dental patients. Oral Surg., Oral Med. & Oral Path. 6:1134 Sept. 1953.

4. Miller, S. C., and Roth, Harry. Torus palatinus: a statistical study. J.A.D.A. 27:1950 Dec. 1940.

refer the patients for diagnosis and treatment.

The lesion consists of an overgrowth of bone which may be smooth or lobulated and attached by either a sessile or pedunculated base. The bone is noncompressible and is covered by a thin normal mucosal covering. These growths are symptomless unless irritative lesions form on the covering mucosa. The etiology of the condition is unknown, although some persons feel they may have a hereditary background.[5] Others feel they represent an overgrowth of bone as a compensatory mechanism for an excessively developed masticatory apparatus,[6] and still others feel they result from a continued growth of the palatal processes that results in a lipping downward of the palatal vault.[7] Regardless of the etiology, the lesions are of little importance except from a diagnostic standpoint and are readily recognized by the informed examiner. No treatment is indicated unless traumatic lesions develop on the covering mucosa or the bony growth interferes with denture construction. When either of these conditions exists, the tori should be removed surgically.

DOUBLE LIP—The remaining lesions to be discussed that result from congenital or developmental defects occur much less frequently. Double lip is a true congenital anomaly[8] and consists of an accessory fold of redundant tissue in the mucosal portion of the lip just inside the vermilion border. It may occur on either lip but is more noticeable when the upper lip is involved. It is present at birth but does not become noticeable until after the eruption of the teeth and is accentuated when the lip is drawn tight across the teeth in the act of smiling. The condition is readily recognized, as the redundant folds of excessive normal mucosal tissue are visualized just inside the vermilion border whenever the lip is drawn taut. The deformity causes no functional difficulty, but it often presents a cosmetic defect which may be corrected by surgical excision of the excessive tissue.

CONGENITAL LIP PITS—Congenital lip pits present diagnostic problems of importance to the examining dentist. They are asymptomatic lesions located on the mucosal surfaces of the lips and are recognized as small, circular, slightly depressed areas that are slightly darker than the surrounding tissue.[9] The lower lip is more frequently involved, and the pits are usually bilateral, being situated on either side of the midline (Fig. 2, left). When the upper lip is involved, the pit is usually unilateral and is situated at the point where a congenital cleft of the lip would ordinarily occur.[10] The defect consists of an invagination of the mucosa into the underlying connective tissue and varies in depth from 5 to 25 mm. Mucous glands empty into these tracts, and mucus may be secreted from their orifices. They are frequently referred to as paramedian sinuses or lip fistulas. These lip pits are usually small and warrant no concern except that the correct diagnosis must be established.

5. Bernier, J. L. The management of oral disease. St. Louis, C. V. Mosby Co., 1955, p. 657.
6. Bernier, J. L. The management of oral disease. St. Louis, C. V. Mosby Co., 1955, p. 653.
7. Thoma, K. H. Oral pathology, ed. 4. St. Louis, C. V. Mosby Co., 1954, p. 1246.
8. Dingman, R. O., and Billman, Howard. Double lip. J. Oral Surg. 5:146 April 1947.
9. Traeger, K. A. Congenital fistulas of the lower lip: report of case. J. Oral Surg. 12:69 Jan. 1954.
10. Watanabe, Y., and others. Congenital fistulas of the lower lip. Oral Surg., Oral Med. & Oral Path. 4:709 June 1951.

On occasion, however, a rare lesion will be encountered that is large enough to present a cosmetic defect; this should be removed surgically.

MEDIAN RHOMBOID GLOSSITIS—Median rhomboid glossitis is a developmental anomaly of the tongue resulting from the failure of the two lateral halves of the tongue to fuse before the tuberculum impar becomes interposed between them.[11] The result is a roughly rhomboid, tufted area of deep red tissue, completely devoid of papillae, slightly elevated above the remaining portions of the tongue, located just anterior to the circumvallate papillae (Fig. 2, right). The lesion is usually symptomless, but, because of the absence of papillae, an occasional patient may complain of mild burning sensations in the region. On rare occasions the roughened area may become involved in an inflammatory process and produce mild symptoms. The importance of the lesion lies in the correct diagnosis and assurance of the patient that it is not a malignancy and has no serious implications. Surgical removal is contraindicated, and the only therapy indicated is treatment of the rare inflammatory process that may develop.

FISSURED TONGUE—The last congenital defect to be discussed, fissured tongue, is a condition readily recognized as an abnormal grooving of the tongue. The organ is darker red than normal and contains a deep central longitudinal fissure with

11. Martin, H. E., and Howe, M. E. Glossitis rhombica mediana. Ann. Surg. 107:39 Jan. 1938.

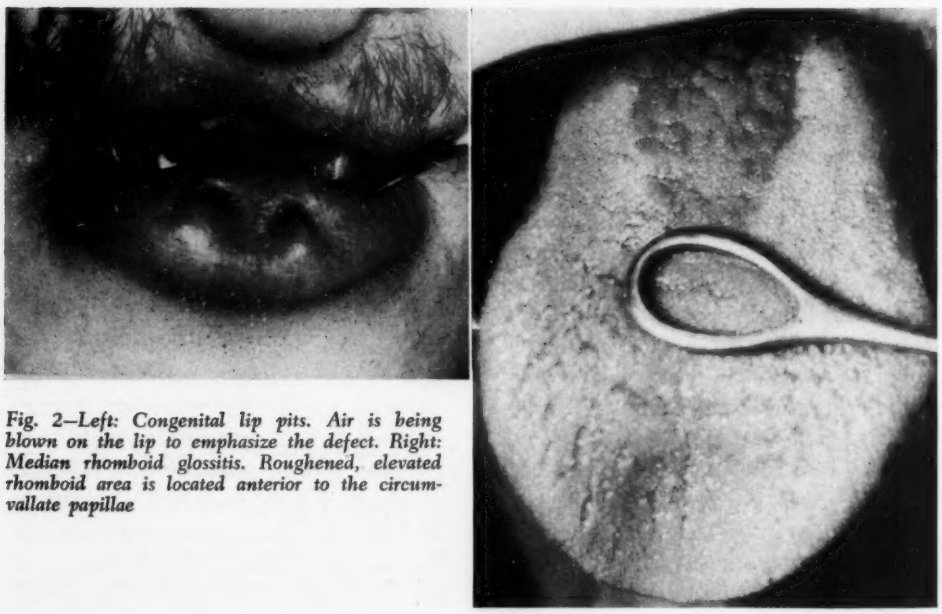

Fig. 2—Left: Congenital lip pits. Air is being blown on the lip to emphasize the defect. Right: Median rhomboid glossitis. Roughened, elevated rhomboid area is located anterior to the circumvallate papillae

shorter grooves on either side. The shorter grooves may radiate from the midline or they may form independently.[12] Frequently, there is an associated macroglossia and occasionally an absence of the filiform papillae. This condition is a true congenital anomaly and treatment usually is not indicated. Occasionally a mild inflammatory reaction results from food accumulation in the grooves, and mechanical cleansing may be necessary. Its importance, as in median rhomboid glossitis, is in correct diagnosis to prevent undue alarm on the part of the patient.

■ *Lesions Producing Changes in the Mucosa*

Lesions producing a change in the color, contour and texture of the mucosa comprise an important segment of the common oral lesions and are frequently encountered in daily practice. Many types of lesions produce these changes. Different etiologic factors and clinical findings are present although they all possess the common characteristic of producing changes of the mucosal surface.

LICHEN PLANUS—Lichen planus is a frequently encountered lesion and its striking clinical characteristic is the color changes it produces in the mucosa. The cause of the disease is not known. It is believed to be associated with anxiety, shock, or mental strain, however, and is seen frequently in people who are emotional or nervous in temperament. People who tend to worry about their health are likely candidates for the disease. Some investigators have attempted, without success, to establish a viral origin for the disease. Several types of intraoral lichen planus are recognized. The most common is the annular or linear type which produces a bluish white, lacelike lesion of the mucosa.[13] The lesions are seen most frequently on the cheek, although any area of the mouth may be affected. The typical lesion consists of thin, irregular, interlacing bluish white lines which fan out and produce a lacelike pattern with ill defined margins. The lesions may vary greatly in size and at times they seem to resemble molds growing under the mucosa. The patient has few subjective symptoms, but on rare occasions he may complain of a slight burning sensation and the feeling of roughness in the involved regions. An outstanding clinical characteristic of this entity is the lack of change in the texture or flexibility of the tissue. The lesions give the impression of involving only the superficial structures in contrast to some of the other keratotic lesions in which loss of pliability of the tissue is an important clinical characteristic.

Although the characteristic lesion of the annular type of lichen planus involving the cheek is well known, other forms of this condition also occur. The mucosa of the lower lip is occasionally involved by these fine lacelike lesions, and sometimes they are so extensive that the normal color of the vermilion border is masked. Annular lesions are also found on the dorsal surface of the tongue, and the clinical findings are characteristic when this organ is involved. Bluish white, superficial appearing lesions, usually seen in the form

12. Bernier, J. L. The management of oral disease. St. Louis, C. V. Mosby Co., 1955, p. 408.

13. Burket, L. W. Oral medicine, ed. 2. Philadelphia, J. B. Lippincott Co., 1952, p. 142.

Fig. 3—Plaquelike lesions typical of lichen planus involving the dorsal surface of the tongue

of solid plaques which at times give the entire tongue a bluish hue, are pathognomonic for the condition (Fig. 3). In this region, as in the other regions involved by lichen planus, there is no change in the texture of the tissue, since only the superficial structures are involved. In fact, the plaques appear to be so superficial that they invite removal by scraping or "wiping" the surface. The lesions, however, are not affected by these procedures.

Dermal lesions are found in a portion of the patients having the typical oral findings of the disease. When the firm, annular, reddish purple skin lesions are present, the diagnosis of the intraoral lesion is simplified. The clinical characteristics of the annular or linear forms of lichen planus are so striking, however, that diagnosis is seldom a problem. On infrequent occasions lichen planus may be confused with other lesions producing a color change in the mucosa, and a histopathologic examination may be necessary to establish a final and definite diagnosis.

The nodular type of lichen planus presents slightly different findings in that the lesions are small and discrete and range in size from that of a pinhead to that of the head of a match.[14] They are grayish white in color and are frequently arranged in clusters. They may occur on any portion of the mucosa.

The third type of lichen planus recognized in the oral cavity is the erosive type. This occurs on the mucosa of the cheeks, palate, floor of the mouth, or gingival tissue and appears as an eroded region with irregular margins and a raw denuded center. Frequently it is possible to see several of the characteristically fine radially arranged bluish white lines about the margin. The raw denuded regions frequently are painful, and the lesions may undergo periods of remission and exacerbation.

The lesions may persist for long periods, and treatment directed to bring about a resolution has been unsatisfactory. Except for the erosive type, the condition is usually asymptomatic and on occasion will resolve spontaneously. It is important to establish a definite accurate diagnosis and to assure the patient it is a harmless condition. Relief of mental anxiety and teaching the patient to live with the disease are important parts of the therapy.

PACHYDERMA ORALIS AND LEUKOPLAKIA—Perhaps the most common of all lesions arising from the mucosal surface are the "white patches" which for years have been referred to as leukoplakia. This term is an all inclusive one which has been used to denote all white patches occurring

14. Bernier, J. L. The management of oral disease. St. Louis, C. V. Mosby Co., 1955, p. 441.

on the mucous membranes. The term leukoplakia, in addition to bringing to mind the typical white lesion of the mucosa, however, also carries the implication of a potentially dangerous or perhaps premalignant lesion. Although it is true that some of the "white patches" are potentially dangerous and may go on to malignant transformation, the majority are innocuous and merely represent a benign thickening of the mucosa developed as a protective mechanism against local stimulation or irritation. Recognition of the difference in these lesions is important, for the potentially dangerous lesion must be attacked vigorously until completely eradicated, while the innocuous variant may be treated in a more conservative manner. Unfortunately, separation of the two entities on a clinical basis is difficult or almost impossible, since both present similar clinical findings. Both may appear as grayish white, elevated, thickened, irregularly outlined regions with well defined margins. Both cause changes in the texture and flexibility of the tissue and may present varying degrees of fissuring and "cracking" of the involved surfaces. Both may involve any region of the oral cavity and may show varying amounts of overproduction of keratin. Furthermore, on occasion, both may present clinical features that are similar to those of lichen planus and other keratotic lesions. Since differentiation on a clinical basis is so difficult and uncertain, other means of separating the two entities is necessary. Fortunately, a biopsy can be depended on to establish an accurate diagnosis.

When the pathologist, in examining a biopsy specimen from a keratotic lesion, recognizes changes in the cells known as dyskeratosis he can with reasonable assurance place the lesion in the potentially dangerous group. If, on the other hand, he fails to see dyskeratosis, he can group the lesion with the innocuous group.[15] Since the clinician cannot make the distinction between the potentially dangerous lesion and the similarly appearing innocuous lesion, it is suggested that biopsy specimens be obtained from every persistent white keratotic lesion that cannot otherwise be identified by its own particular clinical characteristics (lichen planus, and so on) and submitted to the pathologist for histologic examination. Only in this way can an accurate diagnosis be made.

Bernier[16] has advocated the reservation of the term leukoplakia for the keratotic lesions that present the histologic finding of dyskeratosis and has further suggested the term pachyderma oralis for the lesions that do not present this histologic finding. By his reasoning, pachyderma oralis, since it presents no dyskeratosis, is the lesion that has been referred to in the past as leukokeratosis, focal keratosis, and nonspecific keratosis. It undoubtedly represents a defensive thickening of the oral mucosa in response to local stimulating or irritative factors. Chronic trauma, irritation associated with smoking, and the application of drugs, are among the etiologic factors. Clinically, the lesions resemble leukoplakia, and as stated previously, can only be differentiated by microscopic examination. It occurs in older age groups, is frequently found in women, and often is found directly in the location

15. Bernier, J. L. The management of oral disease, St. Louis, C. V. Mosby Co., 1955, p. 437.

16. Bernier, J. L. The management of oral disease. St. Louis, C. V. Mosby Co., 1955, p. 428.

of some irritative factor. The lesions are white, irregular, vary in size, and are characterized by varying degrees of loss of pliability of the tissue.

Treatment of pachyderma oralis is relatively simple and presents few problems. Smaller lesions may be completely removed as an excisional biopsy at the time the specimen is obtained for microscopic examination. Larger lesions, where excisional biopsy is impractical, may be treated by removal of a small section by incisional biopsy to permit microscopic examination. After a diagnosis of pachyderma oralis has been established, the remainder may be treated conservatively by elimination of the irritants, use of vitamin and hormonal therapy and local application of softening agents. This therapy frequently results in regression of the lesion. A lesion once diagnosed as pachyderma oralis that does not respond to this conservative treatment should be viewed with suspicion. Should this occur, the region should be subjected to repeated biopsy study and if dyskeratosis is found at any time, the conservative therapy should be discontinued and the entire region removed by surgery, desiccation or electrocoagulation.

Leukoplakia, as defined by Bernier, presents dyskeratosis on microscopic examination and must be considered as a dangerous and possibly premalignant lesion. It is predominantly a disease of middle and advanced age and is much more common in men. The etiology has not been clearly established. Systemic factors such as vitamin deficiencies and hormonal imbalance, however, may be predisposing factors. Local irritation arising from mechanical, chemical, thermal or bacterial sources which produce chronic irritation over a long period of time is undoubtedly contributory.

The clinical findings vary, depending on the duration and location of the lesion. As in pachyderma oralis and lichen planus, any portion of the oral mucosa may be involved. The lesions present irregular, white or gray thickenings, which vary greatly in size and usually have a fairly sharp line of demarcation between the keratotic region and the normal mucosa. Fissuring and cracking with loss of pliability of the tissue are characteristic of older lesions (Fig. 4). There is no pain associated with the lesions and inflammatory reactions usually are absent. Leukoplakia must be suspected in any persistent keratotic lesion of the mucosa and, as previously pointed out, only by histopathologic examination of the tissue can an accurate diagnosis be made.

Treatment of leukoplakia consists of complete removal. Since dyskeratosis is present and the lesions are considered potentially dangerous and possibly premalignant, they must be vigorously attacked and completely removed. Smaller lesions may be removed completely at the time of biopsy and larger lesions may be removed by excising the mucosa in one or multiple stages. Lesions in regions that do not lend themselves to surgical excision may be removed by desiccation or electrocoagulation.

BLACK HAIRY TONGUE—Changes in color and disturbances of the papillary covering are characteristic of several lesions limited to the tongue. Perhaps the most striking of these is black hairy tongue. The condition is also referred to as

Fig. 4—White, elevated, fissured lesion on lateral border of tongue which on histopathologic examination proved to be leukoplakia. Entire lesion was removed

black tongue, lingua villosa nigra and lingua nigra. It is an entity characterized by certain morphologic changes in the tongue manifested by hypertrophy and elongation of the filiform papillae with an accompanying discoloration. Some investigators[17, 18, 13] feel the abnormal coloring is the result of superficial infection with pigment-producing bacteria, molds, or fungus, whereas others[19] feel it is due to food impaction between the papillae. Regardless of the cause, the end result is an easily recognized, pigmented, soft matted lesion of the dorsal surface of the tongue located anterior to the circumvallate papillae. The elongated filiform papillae are so numerous that a lesion resembling fur or felt is produced. The papillae vary in length and may be parted easily. The abnormal color ranges from yellow to brownish or bluish black and occasionally a greenish tint is noted. This is a harmless condition and usually disappears spontaneously. Some patients become alarmed on discovery of the lesion and request treatment. Application of a solution of 10 per cent salicylic acid followed by vigorous scrubbing with 3 per cent hydrogen peroxide will usually remove the elongated papillae and discoloration.

A condition essentially the same as black hairy tongue is occasionally seen as a complication of oral antibiotic therapy. The tongue lesions appear shortly after the antibiotic is administered and present the same clinical picture as black hairy tongue. Wolfson and others[20, 21] believe it results from the depressor effect of the antibiotic on the normal oral bacterial flora, which then allows the chromogenic molds and fungal spores that are resistant to the antibiotic to multiply and produce the pigmented lesion. It is of no concern

17. Cooper, G. W. Laboratory method in case of false or pseudo black-tongue. West Virginia M. J. 28:126 March 1932.

18. Weidman, F. D. Affinities between black tongue and trichomycosis. Arch. Dermat. & Syph. 18:647 Nov. 1928.

19. Bernier, J. L. The management of oral disease. St. Louis, C. V. Mosby Co., 1955, p. 452.

20. Wolfson, S. A. Black hairy tongue associated with penicillin therapy. J.A.M.A. 140:1206 Aug. 13, 1949.

21. Freeman, H. E. Pigmented hairy tongue accompanying antibiotherapy. A.M.A. Arch. Dermat. & Syph. 65:99 Jan. 1952.

and resolves spontaneously on withdrawal of the drug.

PSEUDOBLACK HAIRY TONGUE—Pseudoblack hairy tongue should be differentiated from black hairy tongue. Various substances such as candy, medicaments, drugs, or decomposing blood clot, may stain the tongue a dark color. In the absence of elongation of the filiform papillae and the superficial bacterial infection or food impaction, however, a diagnosis of true black hairy tongue is not justified.

GEOGRAPHIC TONGUE — Geographic tongue is a condition manifested by one or more nonindurated, red, macular spots located on the dorsal surface of the tongue which enlarge by peripheral extension and are completely devoid of papillae. Several of these enlarging lesions may unite to produce a maplike appearance which gives the entity its name. The lesions change from day to day, giving rise to the names erythema migrans or wandering rash which are frequently used synonymously with the term geographic tongue. It is a condition of unknown etiology, occurs principally in children and women, and is more common in those with a nervous temperament. It produces few subjective symptoms and the patients are frequently unaware of its presence. On rare occasions, patients may complain of a slight burning sensation in the involved regions; the sensation probably is caused by loss of the protective influence of the filiform papillae. The condition requires no treatment, since it is innocuous. It is important, however, to establish a diagnosis and assure the patient that it is self-limiting and of no consequence.

LINGUAL VARICOSITIES—Lingual varicosities are occasionally noted in older individuals. The lingual veins on the ventral surface of the tongue become enlarged and tortuous and present a startling appearance which frequently causes concern. They are recognized as dilated, expanded, purplish regions, roughly approximating the course of the lingual vein and its tributaries. The lesion is of no concern and the patient should be reassured that it is benign. Comparison with the varicosities of the lower extremities with which most individuals are familiar should relieve any anxiety that might be present.

OTHER PIGMENTED CONDITIONS OF THE TONGUE—There are several transitory conditions that produce a change in the color of the tongue. Any pigment-containing substance taken into the mouth frequently produces noticeable coloring of this organ. This is particularly noted when substances are allowed to dissolve in the mouth or are chewed for any length of time. The various types of chlorophyll products, anti-acid tablets, sore throat lozenges, and so on, are the worst offenders. The pigmentation of the tongue is often striking but is extremely transitory and of no consequence. Seldom is diagnosis a problem since a history of use of a pigmented substance is usually obtainable.

LESIONS RESULTING FROM ALLERGIC REACTIONS—An important group of oral lesions characterized by swelling, redness, and occasional ulceration of the mucosa are those associated with allergic reactions to various drugs, medicaments, foods or tooth pastes. Of particular interest are

those reactions associated with antibiotic and chemotherapeutic therapy. With these agents assuming a larger role in the everyday practice of dentistry, the dentist should be familiar with the various allergic responses that he may encounter in his patients.

The exact nature of allergy has not been fully defined, but in a broad sense it may be designated as an altered reaction or response of the tissues to some substance that in the normal individual under the same circumstances produces no symptoms or reactions.[22] It has been further described as a "perversion of the normal protective reactions of the body to environmental maladjustment."[23] The allergic reactions of most concern to the dentist are those associated with drug sensitivity and those resulting from contact with allergenic agents. These are referred to as stomatitis medicamentosa and stomatitis venenata.

Stomatitis medicamentosa represents an allergic response to a drug after it has been absorbed. The reaction is usually delayed and may produce lesions on any part of the body. When the oral cavity is involved, the primary finding is an erythema followed by redness and edema. Finally lesions are produced that may go on to vesicle or bleb formation. These vesicles or blebs soon rupture, leaving raw, denuded, painful regions. The onset of the eruption usually is sudden and constitutional symptoms may or may not be present. Secondary infection of the denuded lesions is a constant possibility which prolongs the duration of the episode and complicates therapy.

Stomatitis venenata, or contact stomatitis, results when an area of tissue becomes sensitized through contact with an allergen. Medicaments, dental materials, tooth pastes, mouth washes, oral lozenges, and cosmetics are among the causative agents.[24] The lesions produced are not specific but are usually observed as edematous, inflammatory reactions with varying amounts of sloughing or ulceration of the mucosa. They develop rapidly at the point of contact, usually cause a burning or itching sensation, and resolve slowly on removal of the causative agent. Diagnosis of this condition is not difficult and is based on an evaluation of the location of the lesion and a history of contact with a possible sensitizing agent.

Particular mention should be made of the mucosal reactions to penicillin. Parenteral administration of the drug produces few oral manifestations, but local application in the form of ointments, pastes, sprays, or lozenges frequently produces reactions.[25] The first manifestation is usually a fiery red appearance of the mucosa, particularly the mucosa of the soft palate and throat.[26] This may be classed as a stomatitis, and the condition frequently leads to the formation of multiple shallow ulcerations. When the causative agent is withdrawn, the tissues gradually return to normal. Tongue lesions also may be noted as the result of this local application of antibiotics. An exfoliation of the filiform papillae with a painful, fiery red tongue may be seen. On

22. Burket, L. W. Oral medicine, ed. 2. Philadelphia, J. B. Lippincott & Co., 1952, p. 88.

23. Bernier, J. L. The management of oral disease. St. Louis, C. V. Mosby Co., 1955, p. 260.

24. Loveman, A. B. Stomatitis venenata. Arch. Dermat. & Syph. 37:70 Jan. 1938.

25. Cormia, F. E.; Jacobsen, L. Y., and Smith, H. E. Reactions to penicillin. Bull. U. S. Army Med. Dept. 4:694 Dec. 1945.

26. Cross, W. G. Oral reactions to penicillin. Brit. M. J. 1:171 Jan. 29, 1949.

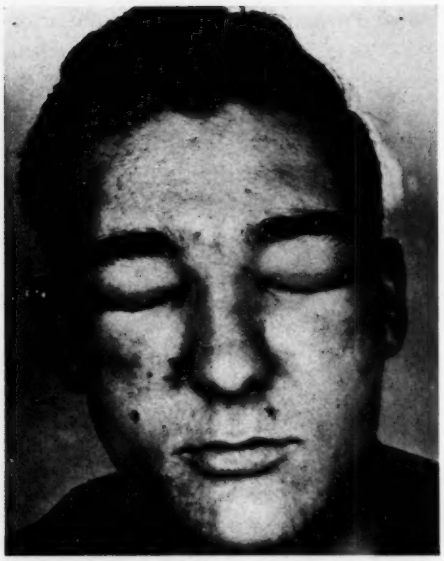

Fig. 5—Typical edema and urticaria resulting from an allergic reaction to penicillin

other occasions, lesions similar to the black hairy tongue may result.

Similar lesions are rarely seen when the other antibiotics are used. Isolated instances of allergic oral lesions after administration of streptomycin[27] and chlortetracycline[28] have been reported, but they are infrequent. The sulfonamides[29] also have been reported to cause an occasional oral lesion.

The dentist should also be familiar with the generalized reactions to these agents, as they usually are more spectacular and cause greater morbidity than the oral lesions. These reactions may be immediate, but the majority are delayed, making their appearance in from 8 to 12 days and representing a true antigen-antibody reaction. Edema, particularly about the face, eyes, and small joints, urticaria, pruritis, and skin rash are the common observations (Fig. 5). Less frequently seen is an exfoliative dermatitis and a hemorrhagic bullous eruption of the skin.

Treatment of these allergic reactions is in the realm of the internist and consists of withdrawal of the drug, antihistamine therapy, and general supportive care. In refractory cases, it may be necessary to resort to intravenous procaine to control the pain and cortisone therapy to control the inflammatory reaction.

CHEMICAL AND THERMAL BURNS—Lesions resulting from allergic sensitization should not be confused with simple chemical or thermal burns. Many of the medicaments used in dentistry such as phenol, silver nitrate, or trichloracetic acid, will produce a painful, inflamed sloughing lesion when allowed to come in contact with the mucosa. Aspirin, when held in prolonged contact with the oral tissues, will produce a characteristic, thick, white membranous lesion which leaves a raw, bleeding region when it is removed. Hot instruments or overheated dental handpieces will produce similar burns when they are allowed to come in contact with soft tissues. These lesions resulting from chemical or thermal sources are not difficult to recognize and present no problem in diagnosis. Care should be employed in applying drugs or heated instruments to prevent their occurrence.

27. Beham, H., and Perr, H. Stomatitis due to streptomycin. J.A.M.A. 138:495 Oct. 16, 1948.

28. Peck, S. M., and Feldman, F. F. Sensitivity reactions to aureomycin. J.A.M.A. 142:1137 April 15, 1950.

29. Dennie, C. C. Angioneurotic edema and dermatitis venenata-like lesions due to oral administration of sulfathiazole. J.A.M.A. 120:197 Sept. 19, 1942.

TRAUMATIC LESIONS — Traumatic lesions of the lips, cheeks, and tongue are frequently associated with accidents, falls, or fights. These lesions usually are frank lacerations and are characterized by irregular ragged margins, swellings and pain. Frequently, secondary infection is a complicating factor. Diagnosis of this type of lesion presents no problem, since there is a direct relation between the traumatic episode and the appearance of the oral lesion. Diagnosis of other forms of oral traumatic lesions presents more of a problem. Lesions associated with improper toothbrushing habits, denture irritation, defective fillings, carious teeth, or foreign bodies, are frequently seen. There is no uniformity of the type of lesion produced by these various agents, and a complete history and careful observation frequently are necessary to arrive at a correct diagnosis. The lesions resolve promptly on removal of the cause. A careful and diligent search should be made to discover the causative agent, for persistence of any chronic irritative lesion may predispose to malignant transformation.

Another characteristic traumatic intraoral lesion is the one caused by chewing the lips, cheeks, or tongue. Frequently people of a highly nervous temperament will develop the habit of chewing one of these regions during periods of stress or concentration. The condition produced is usually limited to one region and consists of an irregular, diffuse outlined lesion with a milky white, rough, macerated surface (Fig. 6). Patients frequently are unaware of the habit and usually do not complain of pain in the involved region. The macerated lesion is easy to recognize but difficult to correct, since it results from an unconscious habit on the part of most patients. They should be instructed to make every effort to break the pernicious habit and be warned of the danger of continuing the practice.

A similar lesion is occasionally seen after the administration of a local anesthetic solution. Because of the perverted sensation resulting from the anesthetic, a patient may unconsciously or accidentally bite or chew the anesthetized area and produce a traumatic lesion. Patients, particularly children, should be warned of the possibility of producing this type of lesion and told to exercise care until the effects of the anesthesia have been dissipated.

■ *Lesions Characterized by Vesicle Formation*

Many lesions characterized by vesicle or bleb formation are encountered in the oral cavity. These result from various causes and frequently present difficult

Fig. 6—Lesion of buccal mucosa resulting from chewing the cheek. It is characterized by a grayish white macerated surface with irregular margins

problems in differential diagnosis. The various diseases that produce vesicles on the mucosa produce lesions that frequently are similar and are often difficult to differentiate. The primary vesicles are seldom seen in their original state, because they are soon ruptured by the trauma associated with normal oral function. They leave raw, painful, denuded regions that frequently become secondarily infected, and result in lesions that are essentially the same regardless of the initiating factors.

HERPETIC LESIONS—The virus of herpes simplex is probably one of the most common infectious agents in man and produces many varied lesions in the oral cavity. Considerable controversy over the nomenclature and etiology of these similarly appearing oral lesions exists. The terms "herpetic stomatitis," "aphthous stomatitis," "herpes labialis," "acute herpetic gingivostomatitis," "recurrent herpetic stomatitis," "chronic recurrent herpes," "recurrent aphthous stomatitis," "habitual aphthae," and others have been used at various times in connection with these solitary or multiple lesions. Some investigators[30-32] contend that the herpes simplex virus is the causative agent in all instances whereas others[33-34] indicate that the herpetic virus has nothing to do with the lesions known as "recurrent or habitual aphthous ulcers." Kerr[35,36] has written extensively on the subject and has suggested that conclusive proof has been presented to incriminate the herpes virus as the causative agent in all these lesions. He has grouped them under the terms "primary herpetic gingivostomatitis" and "secondary herpetic stomatitis" in an attempt to standardize the terminology and clarify the differential diagnosis.

Primary herpetic gingivostomatitis occurs as single or multiple lesions. When referring to single lesions or groups of isolated lesions, the term herpes simplex frequently is used. The lesions are caused by the herpes virus and may be located on the lips or any part of the oral mucous membrane. Premonitory symptoms of burning, itching, and a feeling of fullness are noted at the site of the developing lesions several hours before the lesions become evident. The lesion then forms as a vesicle filled with a yellowish fluid; however, this vesicle is seldom seen as it soon ruptures. After rupture, it leaves a small, painful, depressed eroded ulcer with epithelial tags about the margins. Edema is a constant observation, and secondary infection is frequently superimposed on the ulcer. As the lesion ages, the tags disappear and are replaced by a bright red elevated border about the lesion. As it ages further, a cheesy yellow opaque material forms over the ulcer which usually lasts for several days. At this point the ulcer usually goes on to resolution and heals without scarring in from 8 to 14 days.

The diffuse form of acute primary gingivostomatitis usually affects children,

30. Woodburne, A. R. Herpetic stomatitis. Arch Dermat. & Syph. 43:543 March 1941.

31. Dodd, K.; Johnson, L. M., and Buddingh, G. J. Herpetic stomatitis. J. Pediat. 12:95 Jan. 1938.

32. Scott, T. F. M.; Steigman, A. J., and Convey, J. H. Acute infectious gingivostomatitis. J.A.M.A. 117:999 Sept. 20, 1941.

33. Blank, H., and others. Recurrent aphthous ulcers. J.A.M.A. 142:125 Jan. 14, 1950.

34. Burket, L. W. Oral medicine, ed. 2. Philadelphia, J. B. Lippincott Co., 1952, p. 148.

35. Kerr, D. A. Stomatitis and gingivitis in the adolescent and preadolescent. J.A.D.A. 44:27 Jan. 1952.

36. Kerr, D. A. Herpetic gingivostomatitis. J.A.D.A. 44:674 June 1952.

but occasionally the adult may be affected. The initial infection frequently follows conditions that lower body resistance, such as upper respiratory infections, infectious mononucleosis, or gastrointestinal disturbances. Before the local lesions appear, there is usually an exaggerated systemic response manifested by fretfulness, irritability, and excessive dehydration. As the disease progresses there may be a sore throat and tenderness of the submental, submaxillary, and cervical regions. An elevation in temperature is noted during the primary episode; this elevation continues for three to five days, subsiding slowly after the appearance of the mucosal lesions. These lesions are characterized by a red, swollen, "boggy," painful, bleeding condition of the oral mucosa. The initial red, swollen, painful lesions are gradually replaced by vesicles which rupture and form the typical herpetic ulcer described earlier. Several of these ulcers may coalesce and form large irregular painful lesions. The lesions gradually recede and heal within 10 to 14 days without scarring of the mucosa.

Secondary herpetic stomatitis occurs frequently and produces the same mucosal lesions as those seen in the primary form of the disease. It is felt that the causative virus becomes localized within the cells[37] of the individual as a result of a primary herpetic infection at some earlier time, and that this residual virus may be activated at intervals to produce the typical recurrent lesions. Conditions, such as exposure to sunlight, gastrointestinal disturbances, upper respiratory infections, menstruation, allergic reactions or localized trauma, may be the activating factors. The lesions are usually multiple and present the same premonitory and clinical findings as the isolated herpetic lesions and resolve in the same manner.

Treatment is directed toward relief of the symptoms and attempts to prevent recurrence. The extremely painful local lesions may be relieved by the use of anesthetic troches or by the application of tincture of benzoin to the dried individual lesions. Chlortetracycline troches may be of value in limiting the disease and preventing secondary infection. Local application of nonirritating bactericidal drugs is also helpful in preventing the secondary infection. General supportive care is indicated in the acute form and consists of rest, proper nutrition, and adequate fluid intake. In severe instances, parenteral antibiotic therapy is indicated. Attempts to prevent the recurrent lesions have met with varied success. Hormonal and vitamin therapy, smallpox vaccine,[34] antibiotics, and psychotherapy have been tried by various investigators, but no reliable method of preventing the recurrent lesions has emerged.

ERYTHEMA MULTIFORME—Erythema multiforme is a common dermatologic disorder that frequently involves the oral cavity. The exact nature of the disease has not been determined, but it is felt that it may be an allergic reaction to foods or drugs[38] or may possibly follow sensitization to some form of bacterial invasion. Attempts to establish a viral origin have been unsuccessful although some instances are

37. Burnet, F. M. Virus as organism; evolutionary and ecological aspects of some human virus diseases. Cambridge, Mass., Harvard University Press, 1945.

38. Burket, L. W. Oral medicine, ed. 2. Philadelphia, J. B. Lippincott Co., 1952, p. 156.

associated with viral respiratory diseases.[39] It is found most frequently in children and young adults and runs its course in from one to several weeks. The oral lesions are characterized by the formation of large bullae or vesicles which rupture early leaving large denuded regions surrounded by epithelial tags. The lips, cheeks, and tongue are the areas most frequently involved and the gingival tissues usually are spared. The lesions usually are larger, more hemorrhagic, and more widespread in their distribution than are herpetic lesions. The raw denuded regions are soon covered by a blood-crusted yellowish coating, and secondary infection frequently produces a red inflammatory reaction about the lesions (Fig. 7). The condition is extremely painful and since large areas of the mouth are involved, the patient has difficulty in eating or taking fluids by mouth. A moderate sialorrhea is a frequent complicating factor. The oral lesions persist from one to several weeks and heal without scarring.

The oral lesions may appear alone or in conjunction with dermal lesions. Diagnosis is simplified when the typical erythematous, bright red lesions that fade to a deep purple as they age are noted on the skin. The face and back of the hands and arms are the common locations of the skin lesions.

A form of erythema multiforme referred to as Stevens-Johnson disease is also recognized.[40] This condition is associated with noticeable constitutional signs, such as malaise, headache, and elevation of temperature, and in addition to the oral manifestations presents an inflammatory reaction involving the mucosa of the eyes, urethra, and penis.[41] This form of the disease is recurrent, but like erythema multiforme, it is self-limiting and runs its course in approximately the same time.

Treatment of the oral lesions consists of efforts to relieve the pain and prevent secondary infection. Because of the diffuse involvement of the mouth, antibiotic therapy is indicated to prevent secondary infection and the application of one of the nonirritating bactericidal drugs frequently is of value. Because of the possibility of the entity being allergic in nature, antihistamines may be employed and cortisone is of value if the condition is severe and refractory. A bland diet should be prescribed, since any spicy or acid substance causes severe pain when brought into contact with the raw oral lesions. Frequently it is necessary to spray the mouth with .25 per cent tetracaine hydrochloride solution or apply anesthetic troches before meals to enable the patient to eat. The lesions finally resolve and heal without scarring.

■ *Tumorlike Proliferations and Neoplasms*

The general heading, tumorlike proliferations and neoplasms, covers a wide variety of intraoral lesions which are grouped together because they have the common clinical manifestation of enlargement of the tissue. Included are the lesions resulting from the retention phenomena; tissue proliferations resulting from hyper-

39. Soll, S. N. Eruptive fever with involvement of respiratory tract, conjunctivitis, stomatitis and balanitis: an acute clinical entity, probably of infectious origin; report of twenty cases and review of the literature. Arch. Int. Med. 79:475 May 1947.

40. Stevens, A. M., and Johnson, F. C. New eruptive fever associated with stomatitis and ophthalmia. Am. J. Dis. Child. 24:526 Dec. 1922.

41. Chipps, J. E. Erythema multiforme exudativum (Stevens-Johnson syndrome). Oral Surg., Oral Med. & Oral Path. 4:345 March 1951.

plasia and hypertrophy; proliferations associated with hormonal disturbances, and true neoplasms. Only the more frequently encountered lesions will be discussed in this article.

RETENTION PHENOMENA—The mucosa of the oral cavity abounds with many small mucous glands which are subject to a retention phenomena characterized by the retention of a mucoid material and accompanied by degenerative changes in the gland structure. Mucous retention cysts or mucoceles result, and stenosis or obstruction of the excretory ducts has for years been proposed as the causative factor. These cysts are reported to consist of thin walled fibrous sacs lined with epithelium and filled with a mucoid material.[42] In many the epithelial lining is absent, a phenomenon that has been explained on the basis of destruction of the epithelium by pressure of the enclosed mucoid material or by infection. Recent work by Bhaskar[43] has thrown new light on this subject. Stimulated by the observation of the absence of epithelial lining in many of these so called cysts, he concluded that perhaps the lesions did not represent true cystic formation of obstructive origin. He tried to produce the lesions experimentally in animals by tying off the excretory ducts of the mucous glands and was unsuccessful in creating the lesion. He was able to produce the lesion by merely incising or cutting a window in the excretory duct and allowing the secretions of the gland to escape into the subcutaneous tissue. He concluded that the lesion was in reality caused by trauma to the excretory duct which allowed the escape of mucoid material into the soft tissue where it produced an irritative effect that resulted in the typical mucocele.

Fig. 7—Erythema multiforme involving the lips and tongue. The blood crusted, irregular, painful lesions are characteristic of the disorder

Mucoceles are located most frequently on the mucosal surfaces of the lips, cheeks, and ventral surface of the tongue and are only occasionally seen on the palate or dorsal surface of the tongue. They are round, painless, soft tissue swellings which are soft and fluctuant because of the retained secretions. As they enlarge and approach the surface, they present a bluish white appearance (Fig. 8). They protrude into the oral cavity and are often traumatized by the teeth during mastication. Occasionally the trauma is sufficient to rupture the wall of the cystic lesion, which allows the escape of a thick mucoid material. After this, the cyst collapses, only to recur when the wound heals.

Diagnosis presents no problem, since the clinical findings are characteristic. Treatment consists of wide surgical ex-

42. Thoma, K. H. Oral pathology, ed. 4. St. Louis, C. V. Mosby Co., 1954, p. 1156.
43. Bhaskar, S. N. Personal communication.

Fig. 8—Typical mucocele involving the mucous glands of the lip. A bluish white, soft fluctuant mass is pathognomonic for the condition

cision; such excision should include the involved gland.

Retention phenomena in the floor of the mouth result in the formation of a ranula. Obstruction of the duct of one of the major salivary glands, usually the sublingual, has been proposed as the causative factor. There is considerable evidence, however, that this is not always the case, and many of the lesions are possibly remnants of cervical sinuses. The lesion produced is usually unilateral, but when large it may involve both sides. It is a painless, soft, fluctuant mass, covered by an intact mucous membrane and obviously contains fluid. It slowly enlarges, thinning out the mucosal covering which gives it a typical bluish color with a "frog-belly" appearance. It may enlarge sufficiently to interfere with movements of the tongue, and thus interfere with speech and mastication. On opening the mass, a thick, mucoid material is discharged.

Diagnosis of the large superficial ranula rarely presents a problem. When deeply placed, however, it may be confused with mesodermal tumors, hemangiomas, or dermoid cysts. Aspiration of the typical thick, mucoid material may be necessary to establish a definite diagnosis. Treatment consists of surgical removal, usually by a marsupialization procedure.

SOFT TISSUE HYPERTROPHY AND HYPERPLASIA—Tissue proliferations resulting from chronic irritation are characteristic of many oral lesions. Hypertrophy is the term used to denote an enlargement of a tissue due to an increase in the size of the individual cells, while hyperplasia refers to an enlargement of a tissue due to an increase in the number of its component cells. In dealing with tissue enlargements or proliferations resulting from irritation, an attempt to separate the two processes is probably not indicated, since they both undoubtedly participate in the process.[44]

Many varieties are recognized, such as the irritation fibroma, hypertrophic oral mucosa, epulis granulomatosum, and epulis fissuratum. All have in common proliferation of the soft tissue as the result of some continued irritation. The resulting lesions vary in size, color, and consistency, depending largely on the severity of the irritation and the length of time they have existed. Proliferations consisting of granulation tissue form rapidly, are soft and pliable, and bleed easily when traumatized, but as they age they may become epithelized with resultant changes in their clinical characteristics. Other proliferations, such as epulis fissuratum and irritation fibroma, develop more slowly, may be soft or hard, depending

44. Bernier, J. L. The management of oral disease. St. Louis, C. V. Mosby Co., 1955, p. 671.

on the tissue content, bleed rarely, and are covered by an intact epithelium.

Regardless of the type, diagnosis of this group of lesions is not difficult, since the irritative factor usually is prominent and the cause and effect relationship is obvious. They should all be treated by surgical excision after removal of the irritative factor.

DILANTIN HYPERPLASIA — A lesion known as Dilantin hyperplasia has been recognized for years, but the exact etiology of the condition has remained in doubt. As more knowledge of allergic reactions is obtained, there is considerable evidence that this entity should possibly be included with this group.[45] As the result of administration of sodium diphenylhydantoin (Sodium Dilantin) as an anticonvulsant drug, a certain group of patients develop gingival enlargement. The lesions develop slowly, are firm in consistency, and do not bleed readily unless complications caused by secondary infection occur. The extent of the enlargement varies from a mere involvement of the interdental papillae to massive proliferations that may cover the crowns of the teeth (Fig. 9). Unless an inflammatory process is superimposed, the proliferation tissue is the same color as the surrounding normal mucosa. The occurrence and degree of proliferation cannot be correlated with the dosage or length of administration of the drug, nor is sex or age a determining factor in the development of the disease. There is considerable evidence that local irritation and poor oral hygiene are predisposing causes.

Diagnosis depends on recognition of the typical gingival lesions with an accompanying history of intake of the drug. Other side effects of diphenylhydantoin sodium therapy, such as nervousness, blurring of the vision, diplopia, nausea and vomiting or anorexia may be present. The gingival enlargements, however, are frequently the only sign of reaction to the drug. Treatment consisting of removal of the local irritative factors and scrupulous oral hygiene is often sufficient to control the enlargement in mild involvement, but surgical removal of the excessive tissue is sometimes indicated if the condition is more advanced.

Fig. 9—Gingival enlargement in 12 year old child after prolonged administration of diphenylhydantoin sodium as an anticonvulsant agent

HORMONAL PROLIFERATIONS — Proliferations of the gingiva are frequently seen during periods of hormonal imbalance. The changes occurring during pregnancy are the most striking; however, disturbances at puberty, during the menses, and at the menopause are also recognized.

45. Bernier, J. L. The management of oral disease, St. Louis, C. V. Mosby Co., 1955, p. 269.

Fig. 10—Pregnancy tumor. Proliferation formed at site of loose bridge abutment which served as a source of chronic irritation

Regardless of the cause, the outgrowths are characterized by a peak of growth activity which declines as the hormonal imbalance recedes.

The proliferations seen during pregnancy are designated as pregnancy gingivitis or pregnancy tumors, and these conditions are so characteristic that few diagnostic problems are encountered. They are in reality the same condition, merely representing different degrees of involvement, one being diffuse whereas the other is localized in character. Hormonal and vascular changes, usually complicated by infection, are generally considered the etiologic factors, although local irritation is probably necessary to initiate the proliferations.[46] The lesions usually develop during the second trimester of pregnancy. In pregnancy gingivitis there is a generalized involvement of the marginal gingiva, particularly noticeable in the interdental papillae and characterized by a soft, "boggy," reddish purple enlargement that bleeds freely at the slightest trauma. The lesions are not painful and seldom ulcerate. Pregnancy tumors are localized enlargements usually forming at the site of some obvious irritation (Fig. 10). They vary in size, are soft and pliable, and present a cauliflower appearance. They usually develop from the interdental papillae and bleed readily at the slightest trauma. A typical dark blue or purplish red color is characteristic of the lesion.

Treatment is symptomatic and usually consists of removal of the local irritative factors followed by a thorough oral hygiene regime. Occasionally surgical removal of the pregnancy tumors is indicated when their size is sufficient to cause annoyance or interfere with function. They frequently recur, however, after removal. The lesions usually recede after parturition.

NEOPLASMS—Any of the soft tissues entering into the formation of the oral cavity may undergo neoplasia, and a great variety of tumors may result. If the epithelium alone undergoes neoplasia, a papilloma is formed, whereas neoplastic activity of the connective tissues results in the formation of fibromas, lipomas, and so on. Tumors arising from nerve, muscle, lymphatic, or vascular tissues also may be encountered, adding to the complexity of tumors that may involve the oral cavity. Only the more frequently encountered tumors will be discussed.

Papilloma is a benign epithelial tumor most frequently located on the palate, cheeks or tongue. Two varieties are recognized—the hard and the soft—

46. Nesse, G. J., and Ziskin, D. E. Pregnancy gingivitis. Am. J. Orthodont. & Oral Surg. (Oral Surg. Sect.) 32:390 June 1946.

but they are essentially the same tumor and differ only in the amount of keratin produced. The hard papilloma (Fig. 11) becomes hornified and frequently resembles a verruca, while the soft papilloma is soft and pliable and adapts itself to its environment. Papillomas vary in size and extent from the surface of the mucosa and are attached by either a pedunculated or sessile base. As they proliferate they develop folds, each of which thickens into a lobe and a cauliflower-like mass is produced. They vary in color, depending on the degree of keratinization and the amount of secondary inflammation present. The diagnosis of this lesion is usually evident from the clinical observations, and they should all be removed by surgical excision with an adequate base of normal tissue and should be submitted for pathological examination. Thoma[47] has reported on several papillomas that have undergone malignant transformation.

Fibromas and lipomas are the most common of the connective tissue tumors encountered in the oral cavity. They form well defined, firm, encapsulated tumors that arise from the submucosal connective tissue, periosteum, or periodontal membrane. They usually project from the surface of the mucosa and are attached by a pedunculated or sessile base. They display a slow rate of growth and vary greatly in size. They are covered by a normal mucosal covering unless it has become ulcerated by associated trauma. They may occur on any portion of the mucosa, but the tongue and cheeks are the favorite sites.

Combinations of tissue may enter into the formation of the connective tissue tumors; thus, myxofibromas, lipofibromas or neurofibromas may be encountered. Their manifestations are clinically similar to those just described, and microscopic examination is necessary to determine the exact histologic diagnosis.

Although the majority of the connective tissue tumors grow out into the mouth, occasionally one is encountered that is growing down into the underlying tissue. Diagnosis of these tumors is more difficult and cannot be made definitely until surgically explored. They should be suspected when a well defined, firm, noncompressible, mobile mass, which yields no fluid on aspiration is palpated in the deeper tissues.

As with the epithelial tumors, diagnosis of these tumors is usually possible from the clinical examination; however, they should be surgically excised and submitted for histopathologic study.

47. Thoma, K. H. Oral pathology, ed. 4. St. Louis, C. V. Mosby Co., 1954, p. 1445.

Fig. 11—"Hard" papilloma of mucosa of hard palate. Resemblance to a verruca is evident

Hemangiomas are benign tumors made up of newly formed blood vessels. They usually are congenital in origin and may involve any organ or tissue of the body, although it has been estimated that 95 per cent occur about the head and neck.[48] Many are small and asymptomatic, whereas others attain huge proportions

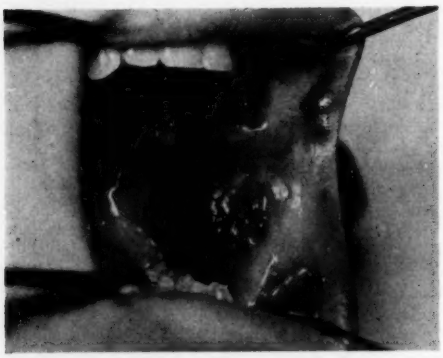

Fig. 12—Large, irregular, nodular, bluish red lesion typical of hemangiomas involving the buccal mucosa

and produce considerable deformity and dysfunction as well as unsightly cosmetic defects. Ulceration may occur spontaneously or as the result of trauma, and recurrent acute infections in the tumors is not unusual.[49] These conditions may result in serious or even fatal hemorrhage.

Many classifications of hemangiomas have been proposed, but basically there are two types, the capillary and the cavernous. The capillary hemangiomas are important because they frequently involve the skin of the face and neck where they present unsightly cosmetic defects. They are composed of thin dilated capillaries lined by either an adult or embryonic type of endothelium and only involve the superficial structures. They are recognized on the skin as the typical red, blue or purple birthmarks and are so characteristic that diagnosis is no problem. They occasionally involve the oral mucosa, but like their counterpart on the skin, they present such a characteristic picture that recognition is immediate. No treatment of the intraoral capillary hemangioma is indicated, and since they involve only the most superficial structures, they do not add appreciably to the amount of hemorrhage when involved in a surgical field.

The cavernous hemangioma is the variety that may cause difficulty. They are soft, compressible tumors, consisting of large, thin walled sinuses filled with blood and having a limited quantity of intervening connective tissue stroma. These tumors may involve either the soft tissue or osseous structures, and on occasion the same tumor may involve both the soft and hard structures. Only the soft tissue tumors will be considered here since a complete description of the intraosseous tumors has been included in another article.[50]

As a rule, hemangiomas situated in the soft tissues of the oral cavity present few diagnostic problems. When superficially located, the characteristic bluish purple color, the irregular outline, the nodular appearance, and the ability to compress blood from the tumor, are patho-

48. Bellot, A. Quoted by Andren, Gunner. Radium treatment of haemangiomata, lymphangiomata and naevi pigmentosi. Experiences from "radiumhemmet", 1909-24. Acta radiol. 8:1, 1927.

49. Figi, F. A. Treatment of hemangiomas of head and neck. Plast. & Reconstructr. Surg. 3:1 Jan. 1948.

50. Shira, R. B. Surgical treatment of benign soft tissue lesions of the oral cavity. In press.

gnomonic for the condition (Fig. 12). Deeper seated lesions offer more problems in diagnosis because overlying tissues hide the tumor. Engorgement and enlargement of the region after the head has been placed in a dependent position, and ability to force blood out of the mass by compression only to have it rush back when the pressure is released, are signs of a vascular tumor. Occasionally a bruit can be heard on auscultation, and a distinct thrill may be felt on palpation. Aspiration of blood with a large gauge needle from the center of the mass establishes it as a vascular tumor.

Fig. 13—Lymphangioma of the tongue. Rough, nodular, noncompressible pinkish white lesion is characteristic of this group of tumors

Treatment of hemangiomas depends on the observations made in each particular instance. Small asymptomatic lesions require no treatment, but the larger, symptomatic lesions require therapy and may be treated by surgery, radiation, or by the use of one of the sclerosing agents.

Lymphangiomas are similar to hemangiomas, but arise from lymphatic tissue rather than from vascular tissue.[51] They are congenital in origin and consist of endothelial-lined sinuses containing lymph fluid. They are found frequently in the oral cavity, and seem to have a predilection for the lips, cheeks, or tongue. Lymphangiomas are probably the most frequent cause of congenital macroglossia (Fig. 13). The tumors are superficially located and produce a roughened, nodular, "pebbly" appearing, pinkish white lesion of varying size. They are noncompressible and yield little or no fluid on aspiration. They may produce sufficient enlargement of the involved part to interfere with function.

Lymphangiomas require no treatment unless of sufficient size to interfere with function, in which case surgical excision of all or part of the tumor is indicated. Radiation therapy and sclerosing solutions are ineffective in controlling these lesions and should not be employed.

■ *Malignant Lesions*

In any discussion of diagnosis of common oral lesions, brief mention should be made of malignant tumors, not because they are common, but because they are so serious and so important to the patient. Whereas many of the older and larger malignant tumors are so characteristic that diagnosis is easy, the characteristics of the early or incipient malignant lesions are usually so nonspecific and vague that they are frequently overlooked or passed off as being of no consequence. It is in dealing with this latter group of lesions that the

51. Thoma, K. H. Oral pathology, ed. 4. St. Louis, C. V. Mosby Co., 1954, p. 1439.

Fig. 14—Lesion in which a biopsy was necessary to establish a definite diagnosis. It proved to be a squamous cell carcinoma and was treated successfully by a combination of surgery and radiation

dental profession can make a great contribution. If the dentist could diagnose malignant lesions before they present the typical, classical clinical findings of this disease, or if he could discover malignant lesions before he, as the clinician, even suspects them of being malignant, then a great forward stride will have been made in the early detection of this condition which is so essential in the control of this disease. In order to do this, the dentist must view with suspicion any lesion in which the clinical findings are not specific and consider the lesion malignant until proved otherwise. This will require the extensive use of histologic examination to establish a positive diagnosis for many of the lesions, but such a procedure is to be encouraged (Fig. 14). This is particularly true in dealing with any nodular, ulcerated or indurated lesion that does not respond to recognized therapy in a limited period of time.[52] By adhering to this practice, early, accurate, and positive diagnosis will be assured and make possible the early initiation of the indicated therapy.

■ *Summary*

Dentistry, in the past, has been characterized by the technical excellency achieved in the mechanical procedures associated with the fabrication of oral restorations. In recent times, however, there has been a broadening of the concept of what constitutes the scope of dental practice, and dentistry is now considered as an important and integral part of the health team, working together for the best interests of the patient. With this broadening of horizons, the dental profession must assume new and definite responsibilities. Foremost among these is the need to be able to recognize the various conditions that involve the field in which he works. To this end, this discussion has covered the diagnostic criteria of the more common soft tissue lesions encountered in the oral cavity. The need for establishing a correct diagnosis when confronted

52. Castigliano, S. G. Oral cancer. In Oral medicine, ed. 2, Burket, L. W. Philadelphia, J. B. Lippincott Co., 1952. p. 515.

with any deviation from the normal is most important.

Although many of the conditions described are of importance only from a diagnostic standpoint, the fact remains that they often cause concern or alarm to many patients, and establishment of the correct diagnosis is necessary for their peace of mind and well being. The need for a thorough oral examination for all patients is obvious, and it is definitely within the province of the dentist to diagnose the abnormalities he discovers. The dentist should view with suspicion any questionable lesion that presents nonspecific findings, and he should consider the lesion malignant until proved otherwise. The biopsy is an aid in establishing a definite diagnosis if there is any questionable lesion. Since this presentation was primarily concerned with diagnosis, only brief mention has been made of the proper therapy indicated in the treatment of the various conditions.

Intravenous thiamylal sodium anesthesia and the modern muscle relaxants in oral surgery: an appraisal

■ *P. C. Lund, M.D., Johnstown, Pa.*

During the past century the advancement in general anesthesia in oral surgery has chiefly occurred along two divergent paths. First, the introduction of new anesthetic agents and technics, and second, the development of dental and physician anesthetists who are able to utilize these various agents and technics with safety for their patients.

Adams and his co-workers[1] postulated in 1945 that future changes in intravenous anesthesia would be dependent on the evolution of new agents. To be superior to thiopental sodium, a new drug would have to possess all the advantages of thiopental sodium; in addition, it must produce muscular relaxation with less depression, it should be rapidly detoxified and eliminated, and should have fewer toxic side effects. Clinical observations based on a series exceeding 20,000 cases seems convincing evidence that thiamylal sodium fulfills many of the afore-mentioned requisites.[2]

Department of anesthesiology, Conemaugh Valley Memorial Hospital.

1. Adams, R. C.; Lundy, J. S., and Seldon, T. H. Ten years of Pentothal sodium intravenous anesthesia; an evaluation of its past, present and future. Anesthesiology 6:239 May 1945.

2. Lund, P. C. Surital sodium, new intravenous anesthetic agent. Am.J.Surg. 81:637 June 1951.

■ *Chemistry*[3] *and Toxicology*

Thiamylal sodium (Surital Sodium) is an ultra-short-acting thiobarbiturate. It is the sodium-salt of 5-allyl-5 (1-methyl-butyl)-2-thiobarbituric acid.

The chemical structure of thiamylal sodium is similar to that of thiopental sodium, the main difference being that an allyl group replaces the ring structure ethyl side chain. The molecular weight of thiamylal sodium is 276.33.

Laboratory studies performed with animals show that thiamylal sodium as an intravenous anesthetic agent has increased safety factors when compared with other thiobarbiturates.[4-9] The preliminary clinical impressions reported in a previous publication corroborated many of these findings.[2]

■ *Preparation of Solution and Administration*

A 2 per cent solution is prepared by adding 50 cc. of distilled water or normal saline solution to 1 Gm. ampule of powdered thiamylal sodium.

The intermittent injection technic was used for administration of the solution in most instances in the series mentioned, but thiamylal sodium may be administered in a more dilute solution by the continuous drip method.

A safe rate of injection during induction is 1 or 2 cc. at a time until unconsciousness occurs; thereafter, 1 to 5 cc. are administered intermittently to maintain anesthesia at the desired level. The rate and depth of respiration, reflex movements, and the required relaxation are the principle criteria used for additional injections. More rapid administration may induce apnea, whereas a slower rate may necessitate the use of a greater amount of the solution.

■ *Premedication*

The premedication schedules followed were similar to those used with thiopental sodium. The choice of preoperative agent was determined by the age and medical status of the patients. Atropine, scopolamine, meperidine and the short-acting barbiturates were employed either alone or in various combinations.

■ *Curare*

The most significant development in anesthesiology during the past decade has been the introduction of various organic and synthetic "curare" agents. Space permits only a brief outline of this development. In 1595 Sir Walter Raleigh observed the use of a crude form of curare as an arrow poison by South American Indians.[10] In 1865 Claude Bernard[11] published an extensive treatise on the physiological effects of curare, but this drug was first used clinically by two French physi-

3. Confidential unpublished material from department of clinical investigation, Parke, Davis & Co., April 25, 1949.

4. Confidential unpublished material from department of clinical investigation, Parke, Davis & Co., Oct. 6, 1949.

5. Gruhzit, O. M. Unpublished data from Parke, Davis & Co. laboratories.

6. Reutner, T. F., and Gruhzit, O. M. Surital sodium, a new anesthetic and hypnotic. J.Am.Vet.Med. Assn. 113:357 Oct. 1948.

7. Wyngaarden, J. B., and others. Anesthetic properties of sodium-5-allyl-5-(1-methylbutyl)-2-thiobarbiturate (Surital) and certain other thiobarbiturates in dogs. J. Pharmacol. & Exper. Therap. 95:322 March 1949.

8. Shideman, F. E ; Kelly, A. R., and Adams, B. J. Role of liver in detoxification of thiopental (Pentothal) and two other thiobarbiturates. J. Pharmacol. & Exper. Therap. 91:331 Dec. 1947.

9. Wyngaarden, J. B.; Woods, L. A., and Seevers, M. H. Cumulative action of certain thiobarbiturates in dogs. Federation Proc. 6:388 March 1947.

10. Griffith, H. R. Physiological and clinical action of curare. Anesth. & Analg. 25:45 March-April 1946.

11. Bernard, C. Note sur la curarine et ses éffets physiologiques. Bull.Gen.de Therap. 69:23, 1865.

Table 1

Summary of 2,291 oral surgical procedures

Operation	No.	Balanced*				Intravenous					
		Thiopental sodium	Thiamylal sodium			Thiopental sodium		Thiamylal sodium			
		D-tubocurarine	D-tubocurarine	Decamethonium bromide	Succinylcholine chloride	D-tubocurarine		D-tubocurarine		Decamethonium bromide	Succinylcholine chloride
Tooth extractions†	2,051	61	25	237	310	198	178	506	38	383	115
Plastic surgery	12	1	—	—	6	1	—	2	—	2	—
Reduction of mandible	96	10	2	3	6	13	5	31	4	18	4
Intraoral cysts	126	12	—	11	14	16	5	51	2	15	—
Caldwell-Luc operation	6	1	—	—	1	2	1	—	—	1	—
Total	2,291	85	27	251	337	230	189	590	44	419	119

*An intravenous agent plus cyclopropane.
†Including alveolectomy.

cians in 1866 to control epileptic convulsions. In 1939-1940 chondodendron tomentosum extract (Intocostrin) was prepared by Gill, E. R. Squibb & Sons, and others,[10,12] and was administered by Griffith[13] in 1942 to produce muscular relaxation during inhalation anesthesia for abdominal surgery.

Since the introduction of this purified crystalline form of curare, many new synthetic drugs capable of producing muscular relaxation have been prepared. Examples are d-tubocurarine chloride, dimethyl-tubocurarine iodide, mephenesin, tri(diethylaminoethoxy) benzene triethyliodide, Mytolon chloride, and decamethonium bromide.

In 1951 a new ultra-short acting intravenous depolarizing type of muscle relaxant known as succinylcholine iodide was synthesized by Low and Tammelin.[14,15] This was followed by succinylcholine chloride.[16,17]

Table 1 gives a summary of the 2,291 oral surgical procedures discussed in this series. The patients ranged in age from 5 to 84 years and included all types of anesthetic risks. In 1,591 patients thiamylal sodium or thiopental sodium was the sole anesthetic agent, but in 771 of these, various curare preparations were also administered. In 700 patients the afore-mentioned intravenous agents were used as an induction agent for cyclopropane.

Table 2 is a statistical summary of the

12. Gill, R. C. White water and black magic. New York, Henry Holt & Co., 1940.
13. Griffith, H. R., and Johnson, G. E. Use of curare in general anesthesia. Anesthesiology 3:418 July 1942.
14. Tammelin, L. E., and Löw, H. LTl, en syntetisk erog med kurareverkan. Nord.Med. 46:1044 July 1951.
15. von Dardel, O., and Thesleff, S. Clinical experiences with succinylcholine iodide, new agent for muscular relaxation in anesthesia. Nord.Med. 46:1308 Aug. 29, 1951.
16. Foldes, F. F., and others. Succinylcholine dichloride, a new approach to muscular relaxation in anesthesiology. Unpublished.
17. Lund, P. C. Clinical evaluation of succinylcholine chloride as a muscle relaxant in anesthesia. Unpublished.

Table 2

Summary of instances in which muscle relaxants were used

Operation	No.	Balanced*							
		Thiopental sodium	Thiamylal sodium			Thiopental sodium	Thiamylal sodium		
		D-tubocurarine	D-tubocurarine	Decamethonium bromide	Succinylcholine chloride	D-tubocurarine	D-tubocurarine	Decamethonium bromide	Succinylcholine chloride
Tooth extractions†	1,347	61	25	237	310	178	38	383	115
Plastic surgery	9	1	—	—	6	—	—	2	—
Reduction of mandible	52	10	2	3	6	5	4	18	4
Intraoral cysts	59	12	—	11	14	5	2	15	—
Caldwell-Luc operation	4	1	—	—	1	1	—	1	—
Total	1,471	85	27	251	337	189	44	419	119

*Balanced anesthesia (intravenous agent plus cyclopropane).
†Includes alveolectomy.

1,471 instances in which the various muscle relaxants were employed. In 345 instances, d-tubocurarine was used, in 670 decamethonium bromide was used, and in 456 patients succinylcholine chloride was used. In this division of the series thiopental sodium was administered to 274 patients, whereas thiamylal sodium was administered to 1,197 patients.

Table 3 is a summary of the 700 instances in which an endotracheal tube was passed either through the nasopharyngeal or the oropharyngeal route. In 85 instances anesthesia was induced with

Table 3

Summary of instances in which endotracheal tube was utilized

Operation*	No.	Thiopental sodium	Thiamylal sodium		
		D-tubocurarine	D-tubocurarine	Decamethonium bromide	Succinylcholine chloride
Tooth extractions	633	61	25	237	310
Plastic surgery	7	1	—	—	6
Deduction of mandible	21	10	2	3	6
Intraoral cysts	37	12	—	11	14
Caldwell-Luc operation	2	1	—	—	1
Total	700	85	27	251	337

*Cyclopropane administered in all instances.

thiopental sodium, whereas in 615, thiamylal sodium was employed for this purpose. In each instance the muscle relaxant was administered to facilitate laryngeal intubation, and thereafter it was employed to reduce the amount of intravenous or inhalation agents required to produce satisfactory relaxation for the operative procedure. The muscle relaxants were employed as follows: d-tubocurarine in 112 instances, decamethonium bromide in 251 and succinylcholine in 337.

■ *Endotracheal Intubation*

Patients adequately premedicated are carried to the first or second plane of the third stage of anesthesia by the intravenous administration of a 2 per cent solution of thiamylal sodium. The amount of intravenous anesthetic agent required varies with age, build and reflex activity. The average adult man requires approximately 400 mg. (20 cc. of 2 per cent solution); the senile debilitated patients, 200 to 300 mg., whereas a robust young man may require 500 to 1,000 mg. After the induction of anesthesia, succinylcholine chloride is administered by rapid intravenous injection. The amount of this muscle relaxant required also varies; 30 mg. is sufficient in the average adult; 40 to 50 mg. may be required in the robust man; whereas 10 to 20 mg. will suffice in senile, debilitated adults.

Approximately 30 seconds after the injection of succinylcholine chloride, the vocal cords are visualized by direct laryngoscopy and an endotracheal tube is gently inserted into the trachea. The predetermined gaseous anesthetic agents are then administered through an endotracheal assembly. Hereafter, 10 to 20 mg. of succinylcholine chloride are administered when required for muscular relaxation at 5 to 10 minute intervals. Apnea is induced in many instances during induction by the afore-mentioned technic; thus it is advisable to apply a face mask and perform artificial ventilation with oxygen for 30 to 60 seconds before inserting the endotracheal tube. This increases the pulmonary reserve and also permits time for the agents administered to exert their maximum effect.

When employing decamethonium bromide as the relaxant agent for endotracheal intubation, anesthesia is induced as mentioned earlier. This is followed by the rapid intravenous administration of 2 mg. of decamethonium bromide. Then cyclopropane or nitrous oxide is administered by face mask for a period of 3 to 5 minutes after which an endotracheal tube is inserted in the same manner as before. Thereafter, 1 to 2 mg. of decamethonium bromide is administered at 15 to 20 minute intervals as required.

■ *Complications*

A certain degree of respiratory depression or apnea occurs with all intravenous barbiturates and muscle relaxants, whether administered individually or in combination. The extent of this depression varies directly with the amount administered. In this series respiratory depression of a degree sufficient to be clinically significant occurred in less than 10 per cent of the patients. It was considered severe in less than 3 per cent, and was usually of short duration. It was managed uneventfully by controlled or augmented respirations. Apnea, which occurred only when large doses of thiamylal

sodium or muscle relaxants or both were given rapidly, was managed uneventfully by controlled respirations.

■ *Discussion and Comment*

The following remarks regarding thiamylal sodium and the newer muscle relaxants are based on this series of oral surgery cases, as well as on the clinical experience gained in a series of over 20,000 personally supervised administrations of thiamylal sodium in general surgery and an extensive use of the modern curare preparations in anesthesia since 1942.

■ *Thiamylal Sodium*

INDUCTION AND MAINTENANCE—The induction of thiamylal sodium anesthesia is rapid and pleasant without an excitement stage; unconsciousness usually occurs in 30 to 60 seconds. The stages and signs of thiamylal sodium anesthesia are similar to those encountered with thiopental sodium anesthesia. The state of hypnosis without producing surgical anesthesia can be maintained easily with thiamylal sodium.[18]

The 2 per cent solution of thiamylal sodium is employed because it corresponds in potency to the 2.5 per cent solution of thiopental sodium. This dilute solution, which is nonirritating to the intima of blood vessels, decreases the chance of giving an overdose and also facilitates smooth anesthesia.

There are so many variables affecting the dose of thiamylal sodium required in a particular instance that I do not believe there is a definite maximum dose which should never be exceeded. Should an excessive amount be required, however, it is probably better, if possible, to supplement it with another agent.

The effect of thiamylal sodium on respiration is variable, but in comparable dosages it induces less respiratory depression than thiopental sodium. The pulse rate remains relatively slow during thiamylal sodium anesthesia. Arrythmias, chiefly extra systoles, and bradycardia occur in a small percentage of patients, but these appear in most instances to be related to a low alveolar oxygen concentration.

Thiamylal sodium, like thiopental sodium, being a parasympathomimetic drug, enhances pharyngeal, laryngeal and bronchial reflex activity. This reflex hyperactivity seen with thiopental sodium anesthesia is not present to the same extent with thiamylal sodium anesthesia during comparable levels of anesthesia.

Laryngospasm appears very infrequently, except when secondary to attempts at intubation or insertion of an airway during too light planes of anesthesia, or in patients having excessive bronchial secretions. Coughing is rarely encountered, and hiccoughs occur very infrequently.

EMOTIONAL AND METABOLIC DISTURBANCES—Emergence or postoperative excitement occurred in less than 1 per cent of the patients. Visual disturbances occurred in approximately 3 per cent, but some of these were due to the premedication. Nausea, vomiting and headache occurred postoperatively in a small percentage of the patients. These symptoms were

18. Lund, P. C. Surital sodium intravenous anesthesia: 6000 consecutive cases. To be published in Anesth. & Analg.

frequently secondary to barbiturate or opiate sensitivity or surgical manipulation, or were due to metabolic factors such as dehydration. Briefly, the incidence of untoward reaction or complications secondary to thiamylal sodium, during or after surgery, in a series of 10,000 patients, was found to be less than 1 per cent.[18]

INDICATIONS AND CONTRAINDICATIONS—The indications and contraindications for thiamylal sodium are essentially the same as for thiopental sodium.

DISADVANTAGES—The disadvantages of thiamylal sodium are that it has a sulphide odor which can be detected on the patient's breath very shortly after the intravenous injection. It also induces undesirable pharmacologic reactions, chiefly parasympathomimetic, in the human patient similar to, but less noticeable than those induced by thiopental sodium.

■ *Muscle Relaxants*

There are a large number of various muscle relaxants being used in oral as well as general surgery today. These may be divided into two groups, based on their pharmacologic action. The first group includes such agents as curare or chondodendron tomentosum extract, d-tubocurarine and tri(diethylaminoethoxy)[9] benzene triethyliodide. These preparations interrupt transmission of nerve impulses by inhibiting the physiological depolarizing action of acetylcholine or, in other words, the mechanism is a blocking or neutralization of the acetylcholine reaction. The second group includes succinylcholine chloride and decamethonium bromide. These preparations cause a neuromuscular block by exerting a depolarizing effect on the muscle fibers.[15, 16, 19] This may result in fasciculation or tremors which are a harmless phenomenon caused by the initial stimulating effect of depolarizing drugs on skeletal muscle.

Brief reference will be made to pertinent factors which will aid in the intelligent selection of the most desirable muscle relaxant agent for a particular surgical procedure.

1. D-tubocurarine inhibits ganglionic transmission of the autonomic nervous system.

2. Decamethonium bromide and succinylcholine chloride have no effect on the autonomic nervous system.

3. Tri(diethylaminoethoxy) benzene triethyliodide inhibits the cardiac vagus and causes a tachycardia.

4. Mytolon chloride stimulates the vagus and causes a bradycardia.

The naturally occurring curare preparations such as chondodendron tomentosum extract, d-tubocurarine, and so on, may cause a bronchospasm, laryngospasm, urticaria, increased salivation and fall in blood pressure, as a result of a histamine reaction. This histamine reaction, however, does not occur with the synthetically prepared agents such as tri(diethylaminoethoxy) benzene triethyliodide, decamethonium bromide and succinylcholine chloride.

POTENTIATION BY ETHER—Ether has a curare-like action.[20, 21, 10] Agents such as

19. Castillo, J. C., and deBeer, E. J. Neuromuscular blocking action of succinylcholine (diacetylcholine). J. Pharmacol. & Exper. Therap. 99:458 Aug. 1950.

20. Cullen, S. C. Use of curare for improvement of abdominal muscle relaxation during inhalation anesthesia. Surgery 14:261 Aug. 1943.

d-tubocurarine and chondodendron tomentosum extract are noticeably potentiated by ether, tri(diethylaminoethoxy) benzene triethyliodide is moderately potentiated, whereas decamethonium bromide and succinylcholine chloride are not potentiated by ether at all.

When the afore-mentioned pharmacological data are applied clinically, the following becomes readily apparent: (1) The naturally occurring curare agents are potentially dangerous because of their histamine-release effect and should certainly not be administered to asthmatics or patients suffering from any other allergic conditions; (2) d-tubocurarine chloride is indicated when ganglionic block is desirable; (3) tri(diethylaminoethoxy) benzene triethyliodide[22] is contraindicated in patients with various heart diseases, especially in those who have a tachycardia; (4) chondodendron tomentosum extract or d-tubocurarine probably should not be used with ether anesthesia; and caution should be used when tri(diethylaminoethoxy) benzene triethyliodide or Mytolon are administered during ether anesthesia. Decamethonium bromide and succinylcholine, on the other hand, can be administered with safety during ether anesthesia.

RATE AND DURATION OF ACTION OF MUSCLE RELAXANTS—Most agents require 3 to 5 minutes for maximal effect, tri(diethylaminoethoxy) benzene triethyliodide acts slightly faster, requiring 2 to 4 minutes, whereas succinylcholine requires only ½ to 1 minute. The duration of action of most of these agents is 15 to 25 minutes; decamethonium bromide tends to be slightly less, about 10 to 20 minutes, whereas succinylcholine chloride is only 3 to 5 minutes. The time interval between fractional doses corresponds roughly to the duration of effect of the first dose. Full recovery after the last dose usually takes a few minutes longer than it does after the first dose. With succinylcholine chloride, however, the time for full recovery tends to be approximately the same as the duration of effect of the first dose.

MYTOLON—Mytolon, in my experience, has been an unsatisfactory muscle relaxant because of rather pronounced parasympathomimetic properties. It causes salivation and bradycardia.[23, 24]

TREATMENT OF OVERDOSE OF MUSCULAR RELAXANTS—An overdose of muscular relaxants is treated by administering oxygen by intermittent positive pressure with an anesthetic machine, either by means of a tightly fitting face mask or through an endotracheal tube, until spontaneous respirations are resumed by the patient.[25] Artificial respirations carried out by various manual methods without the use of an anesthetic machine or an apparatus capable of administering oxygen under pressure are inadequate.

Various drugs which are antagonists of the muscle relaxant drugs are available. Neostigminebromide and edrophonium chloride counteract the depressant effects

21. Cullen, S. C. Clinical and laboratory observations on the use of curare during inhalation anesthesia. Anesthesiology 5:166 March 1944.

22. Mushin, W. W., and others. Curare-like actions of tri(diethylaminoethoxy) benzene triethyliodide. Lancet 1:726 April 30, 1949.

23. Dundee, J. W.; Gray, T. C., and Rees, G. J. Win 2747-relaxant agent. Anaesthesia 7:134 July 1952.

24. Hunter, A. R. Win 2747: a study of a new relaxant drug. Anaesthesia 7:145 July 1952.

25. Patterson, R. L. Use of muscle relaxing drugs in anesthesia. Anesth. & Analg. 31:65 Jan.-Feb. 1952.

of d-tubocurarine tri(diethylaminoethoxy) benzene triethyliodide.[26]

Theoretically, antagonists are indicated when persistent respiratory depression is present. In a vast majority of cases, however, it is much safer for the patients if the anesthetist maintains artificial oxygenation until spontaneous breathing resumes rather than administering antagonists all of which have undesirable side reactions.

SUCCINYLCHOLINE CHLORIDE — The mode of action of the new muscle relaxant, succinylcholine chloride, has been mentioned previously. The short duration of its action is due to the fact that it is hydrolyzed by both the plasma cholinesterase and acetylcholinesterase[16, 27] breaking down to choline and succinic acid, both of which are normally occurring metabolites.

TECHNICS OF ADMINISTRATION—The intermittent injection technic was described in connection with endotracheal intubation. Generally, intravenous infusion is started prior to induction of anesthesia, and thiamylal sodium and succinylcholine chloride are injected through rubber sleeve of infusion set.

In the continuous intravenous injection technic, the patients are anesthetized in the same manner as already described in connection with the intermittent injection technic. After laryngeal intubation, a continuous intravenous drip of a 0.15 to 0.25 per cent solution of succinylcholine chloride in normal saline solution is connected to the infusion set. The required degree of muscular relaxation is obtained by regulation of the rate of flow of the succinylcholine chloride solution. This rate varies, but as a general rule, 30 to 60 drops per minute result in adequate muscular relaxation without noticeable respiratory depression.

When the drug is combined with longer acting muscle relaxants, the patients are anesthetized and intubated as described earlier. Then 2 mg. of decamethonium bromide are injected intravenously. Thereafter, supplemental doses of decamethonium bromide, 1 to 2 mg., are administered as required. When muscular relaxation is required for a period less than ten minutes in duration, 20 to 30 mg. of succinylcholine chloride are administered. No incidence of prolonged residual respiratory depression has occurred when this technic was used, nor has any synergistic action been noted clinically.

This technic is excellent for prolonged oral surgery procedures.

DOSAGE—The dose of succinylcholine chloride administered in the series described herein varied widely. It depended on such factors as the age, reflex activity and physical condition of the patients, as well as on the nature and duration of the operative procedure and type of anesthetic agent employed. The average dose of succinylcholine chloride for laryngeal intubation is 30 to 40 mg. This amount produces good relaxation of the musculature of jaw and larynx without respiratory arrest. Thereafter, satisfactory muscular relaxation can be obtained in most instances with intermittent injection of 20 to 40 mg.

26. Sadove, M. S.; Nelson, J. T., and Unna, K. R. Comparative evaluation of curare-like drugs. Anesth. & Analg. 30:221 July-Aug. 1951.

27. Bovet-Nitti, F. Degradazione di alcune sostanze curarizzanti per azione di colinesterasi. Rendic. Ist.super. san. 12:138, 1949.

PHARMACOLOGIC EFFECTS OF SUCCINYLCHOLINE CHLORIDE—The pharmacologic effects of succinylcholine chloride are as follows: (1) There are muscular twitchings or fasciculations which are completely harmless; (2) in muscular relaxation, the muscles are affected or paralyzed in the same order and manner by succinylcholine chloride as by other curare preparations; (3) succinylcholine chloride has no significant effect on the blood pressure or pulse; no allergic manifestations were apparent in the series described. Clinically, the autonomic nervous system appears to be unaffected by succinylcholine chloride, and there is also less depression of the central nervous system than occurs with muscle relaxants.[16]

The effect of succinylcholine chloride on the respiratory activity of an individual varies directly with the dose administered. The rate of respiration is increased while the depth of respiration is decreased. The incidence of postanesthetic respiratory depression is lower than that encountered with other muscle relaxants. It is also clinically apparent that, with comparable relaxation, there is less depression of tidal volume than is encountered with other muscle relaxants.

The advantages of succinylcholine chloride under the following circumstances, because of its rapid onset of action, are as follows:

1. In respiratory emergencies—for example, laryngospasm—the administration of 30 to 50 mg. of succinylcholine chloride enables intubation of the larynx within 30 seconds, thereby facilitating the administration of oxygen.

2. For laryngeal intubation previous to inhalation anesthesia, succinylcholine chloride decreases the duration of the induction period, which increases the safety of the patient and saves time.

Succinylcholine chloride appears to have no real disadvantage at this time, but the fact that vigilance and careful attention must be paid to the administration of this muscle relaxant because of its potency and short action might be considered by some to be a disadvantage.

■ *Summary and Conclusion*

When intravenous anesthesia induced with thiamylal sodium is compared with that induced by thiopental sodium, the following is apparent:

1. Thiamylal sodium produces less respiratory depression and less hypersensitivity of the laryngeal and pharyngeal reflexes.

2. The increase in pulse rate is not as noticeable during thiamylal sodium anesthesia, and recovery is more rapid.

An evaluation was made of the various newer muscle relaxants, and the following advantages of succinylcholine chloride became apparent:

1. Maximum relaxation is produced more rapidly.

2. The degree and extent of muscular relaxation can be controlled more accurately.

3. There is a rapid hydrolysis to harmless end products as well as an absence of undesirable systemic side effects other than respiratory depression.

Whenever intravenous anesthesia is indicated or desirable for oral surgery, thiamylal sodium as a general rule is the anesthetic agent of choice, and succinylcholine chloride is probably the most desirable muscular relaxant agent available at the present time.

Safeguarding biopsy by use of electronic electrosurgery

■ *Maurice J. Oringer, D.D.S., New York*

Cancer therapy must, of necessity, be ruthlessly thorough to be effective and must disregard all consequences except the survival of the patient. Hence cancer surgery invariably entails radical sacrifice of tissue, often accompanied by disfigurement. Even the so-called conservative treatment of cancer with roentgen ray, radium or radioactivated isotopes frequently results in radionecrosis or other damage. These, of course, are entirely secondary considerations when dealing with malignant neoplasms, but, should the lesion prove postoperatively to have been nonmalignant, such tissue destruction would be unpardonable. It is doubly imperative, therefore, that conclusive diagnosis of cancer be established before treatment is instituted.

There appears to be universal agreement among the students of cancer that biopsy is essential for conclusive diagnosis of malignancy. There appears to be equally universal agreement among them that with all suspicious lesions, precancerous as well as malignant, a specimen should be taken for biopsy, wherever it is feasible, and that when done properly, removal of tissue for biopsy can be accomplished without fear of stimulating malignant activity in the lesion.

MacKee and Cipollaro[1] have stated:

> Formerly it was considered dangerous to perform a biopsy in the presence of malignant neoplasm. It is now the consensus of opinion among the students of cancer that a properly conducted biopsy is without danger.

Sachs and co-workers,[2] reporting on their investigations of junction nevus (benign melanoma), and nevocarcinoma (melanocarcinoma), declared:

> . . . we have studied tissue on which numerous clinical diagnoses other than junction nevus have been made. Even though the microscopic diagnosis proved to be junction nevus, we have never known cancer to develop as a result of this practice, nor has biopsy increased the degree of malignancy in existing nevocarcinoma.

Many other outstanding students of cancer, including Ewing,[3] Wood,[4] Hellwig,[5] Boyd,[6] Donnelly,[7] and Satenstein,[8] have likewise expressed their belief that when the removal of tissue for biopsy is properly conducted, there is no danger of disseminating tumor emboli to distant parts. The evidence appears overwhelm-

1. MacKee, G. M., and Cipollaro, A. C. Cutaneous cancer and precancer: a practical monograph. New York, American Journal of Cancer, 1937, p. 196.
2. Sachs, W., and others. Junction nevus-nevocarcinoma. J.A.M.A. 135:216 Sept. 27, 1947.
3. Ewing, J. L. Neoplastic diseases; a treatise on tumors, ed. 4. Philadelphia, W. B. Saunders Co., 1940, p. 112.
4. Wood, F. C. Diagnosis of cancer. J.A.M.A. 95:1141 Oct. 18, 1930.
5. Hellwig, C. A. Biopsy in tumors. Arch. Path. 13:607 April 1932.
6. Boyd, W. Textbook of pathology, ed. 4. Philadelphia, Lea & Febiger, 1943, p. 313.
7. Donnelly, A. J. Symposium on cancer; biopsy. Clinics 4:97 June 1945.
8. Satenstein, D. L. Personal communication reported by Sachs, W., and others. Junction nevus-nevocarcinoma. J.A.M.A. 135:216 Sept. 27, 1947.

ing that the act of taking a specimen for biopsy is not in itself a dangerous procedure likely to stimulate a precancerous lesion to malignancy or to activate a malignant neoplasm to greater malignancy. There appears to be unanimity of opinion among the students of cancer that the dangers involved in removal of tissue for biopsy result from faulty technic, traumatization of the tissues by inexperienced manipulation of the lesion, and the surgical opening of the channels for metastasis of tumor emboli to distant parts. There appears to be further unanimity of opinion among them that these dangers can all be averted when the removal of tissue is effected properly.

Consideration of these opinions raises two questions: (1) Who should take the specimen for biopsy? and (2) How is the specimen taken properly?

The intensive educational campaign concerning cancer has made the lay public acutely conscious of cancer. The presence of palpable masses; adenopathy; induration; rapid growth; alterations of color; chronic, treatment-resistant ulceration, and sudden, unaccountable loss of body weight are danger symptoms that have been publicized so thoroughly that when any of these are noted, fear of cancer usually is aroused and the patient is stimulated to seek examination and diagnosis.

The family dentist, therefore, is often consulted about troublesome oral lesions, and in many instances may be the first one to see previously unrecognized oral cancer. This fact implies familiarity of the general practitioner with cancerous lesions that is misleading, for, in contradiction to the statistical incidence of cancer, the incidence of oral cancer detectable clinically is not high. There are many general practitioners who never see a single instance of oral cancer in their entire dental practice, despite the fact that while performing routine oral examinations they frequently encounter clinical and roentgenologic evidence of other pathologic conditions.

A recent editorial in the *New York Journal of Dentistry*[9] took note of this fact, and drew the conclusion that because of unfamiliarity with malignant neoplasms and with biopsy procedures, the average dentist is unqualified to attempt biopsy of suspected oral malignancies. He therefore should refrain from attempting it, and should refer the patient to a competent specialist without delay.

This does not mean, of course, that because the average general practitioner is usually unqualified to perform the biopsy he therefore is absolved from responsibility to his patient for the early detection and accurate diagnosis of oral cancer when it appears. On the contrary, since he may be the first one to see these lesions, he can render invaluable, perhaps lifesaving, service to the patient by being thorough in his routine dental examinations, alert to recognize early evidence of suspicious pathologic changes, and by referring the patient for conclusive diagnosis without loss of time.

Diagnosis may be established clinically or histopathologically. A clinical diagnosis based on age of the patient, clinical appearance and history of the lesion, roentgenologic examination, blood examination and the subjective symptoms

9. Editorial. Dentist takes a biopsy. New York J. Den. 26:261 Aug.-Sept. 1956.

is always helpful, but is not always conclusive. The biopsy, or microscopic histopathologic examination of a tissue section, is almost always conclusive.

In removal of tissue for biopsy, the dangers mentioned earlier must be guarded against carefully. First of these is the danger of stimulating malignant degeneration in precancerous lesions by inexpert manipulation and traumatization of the lesion. As has been established previously, this danger can best be averted by the dentist's refraining from inexperienced tampering with suspicious lesions. The second danger consists of the possible activation of metastasis in an existing cancer by surgical opening of the channels for dissemination of tumor emboli to distant parts via the hematogenous or the lymphatic routes. Mayo[10] described the paths by which malignant cells reach locations beyond the primary focus:

> Normally only particles of molecular size, such as sugar, the amino-acids, and other crystalloids, are absorbed directly through the vascular capillaries of the body, while colloids and large particles are picked up by the lymphatics. Bacteria and malignant cells do not pass directly into the capillaries, but are carried by phagocytes into the lymphatics which are a closed system of vessels.

Thus it can be seen readily that the danger of mechanical dissemination stems from severance of the blood vessels and the lymphatics by the cold steel scalpel in a malignant region. The incomparable advantage inherent in the employment of electrosurgery which seals off these channels in cutting should be self-evident. Ochsner[11] expressed these conclusions when he wrote:

> Later, metastases are formed by the transportation of infected cells from the original growth to distant parts of the body through the lymph channels or the blood vessels. For a time these infected cells may be interrupted in their journey by intervening lymph nodes. The removal of the original growth together with all of the infected lymph nodes may still result in a permanent cure. This can be accomplished with greater certainty if the removal is carried out with the cautery instead of the knife because the cautery will destroy in its course any cells which may contain cancer infection. If the growth is removed with the knife, and the incision is not made far beyond the infected area, the cancer is likely to spread rapidly because the lymph spaces will be opened through which the infection will be carried beyond the reach of future operation. For the same reason, portions for microscopic examination should always be removed with the cautery before operation.

Blair, Moore and Byars[12] are also among the experts who subscribe to the use of electrosurgery for biopsies.

It therefore appears reasonable to conclude that a biopsy is "properly conducted" when it is performed with electrosurgery to avert the danger of disseminating tumor emboli by sealing off the avenues of metastasis by coagulation as the specimen for biopsy is taken.

■ *Electrosurgical Equipment*

Electrosurgery can be performed with three different types of equipment: the electrocautery; spark-gap generator, surgical diathermy type; and the ultra high-frequency electronic surgical scalpel or radioknife. The three types vary greatly in performance and efficiency, and there is even noteworthy difference in efficiency

10. Mayo, W. J. Relative values of surgery and radiotherapy. Minnesota Med. 8:7 Jan. 1925.

11. Ochsner, A. J. Cancer infection. Surg., Gynec. & Obst. 40:336 March 1925.

12. Blair, V. P.; Moore, S., and Byars, L. T. Cancer of the face and mouth; diagnosis, treatment and surgical repair, ed. 1. St. Louis, C. V. Mosby Co., 1941, p. 39.

between the electronic instruments which deliver fully rectified current output and those which deliver partially rectified current output. Exhaustive comparative evaluation of the various types of electrosurgical equipment and their respective current outputs is not the purpose nor the major concern of this article and is not intended at this time. In brief, the principal difference between them is that the cautery and spark-gap equipment are incapable of producing true cutting currents. They cut tissue by searing or coagulating (or both) and destroying it. When these currents are used for taking a specimen for biopsy, they seal off the avenues of transmission effectively, but in doing so the tissue is coagulated to so great a degree that unless the biopsy section is more than 1 cm. in width, it usually becomes, for diagnostic purposes, a worthless piece of cooked meat.

The electronic equipment produces a true cutting current called electrosection. When this current output is properly employed, it too seals off the avenues of transmission by coagulation. This coagulation, however, is materially different; it is minimal, measuring a minute fraction of a millimeter in depth, is practically invisible to the naked eye, and is almost equally imperceptible even under the microscope, so that the diagnostic value and usefulness of the biopsy is not affected.

Discussing the superiority of electronic electrosurgery, or as he termed it the "endoderm knife," Wyeth[13] made the following observations:

> The cutting current is developed by the three element vacuum tube system and is of such extremely high frequency that it produces a molecular dissolution of the tissues, sealing lymphatics as it cuts by a thin line of coagulation. The encrustation which characterizes the cut of the cautery knife does not follow the use of the endotherm's cutting current, and our records show an unbroken list of healing by primary union, with a thinner, finer, less conspicuous scar, which is gratifying both to the operator and to the patient.

The electronic equipment also is capable of producing a coagulating current output similar in character to that produced by the spark-gap type of equipment, but which does not penetrate as deeply into the tissues as the latter type. The electronically produced coagulating current is therefore much less destructive and can be controlled effectively. Electronic electrocoagulation is especially useful when taking biopsy specimens from large tumor masses and when hemostasis is important.

■ *Technic and Instrumentation*

Proper usage of the current output is a prerequisite for obtaining ideal biopsy specimens with the electronic surgical scalpel. Misuse of the electronic current output can produce excessive coagulation similar in destructive effect to that produced by the cautery and the spark-gap types of equipment, and thereby renders the biopsy specimen unfit for diagnostic purposes. Unfavorable experiences with such biopsies has influenced some oral pathologists to condemn any and all electrosurgical procedures for the removal of tissue for biopsy, maintaining that, since electrosurgery may coagulate the tissues sufficiently to render them diagnostically

13. Wyeth, G. A. Surgery of neoplastic diseases by electrothermic methods, ed. 1. New York, P. B. Hoeber, Inc., 1925, p. 73-81.

valueless, it is contraindicated for biopsy purposes.

There can be no dispute with their contention that coagulated tissue is diagnostically worthless. But, to conclude that because electrosurgery is capable of coagulating tissue to excessive degree, therefore no form of electrosurgery is suitable for taking biopsies, is arbitrary, and constitutes condemnation of a procedure for the technical shortcomings of individual operators. It appears reasonable to assume that these same men occasionally receive biopsy specimens taken by other surgical methods, which have also been rendered worthless for diagnostic purposes because of faulty technic or poor surgical judgment. It appears equally reasonable to assume that in such instances, the blame is placed properly where it belongs, and not on the instruments that were employed.

Success in removal of tissue for biopsy, as in any other surgical procedure, is determined by two basic factors: proper surgical technic and proper instrumentation. Proper surgical technic, which includes determination of the proper size, shape, depth and location of the tissue specimen, is governed largely by surgical experience and judgment. Proper instrumentation, in the case of electronic electrosurgery, involves many interdependent factors. The current output of the electronic surgical scalpel must be regulated to the tissue requirements of the individual case. These requirements are determined largely by the pH of the tissues, density of the tissues, viscosity of the saliva, thickness of the electrode employed, fluctuations of the line output, and similar factors.[14-16]

Proper manipulation of the electrodes, to make most effective use of the current output, is equal in importance to the need for regulation of the current output. This entails use of a technic of instrumentation that is, to all intents and purposes, the exact opposite to what must be done when the cold steel scalpel is employed. Whereas pressure must be applied to perform an incision with the cold steel scalpel, and the line of incision is extended deliberately, in electronic electrosurgery the electrode, to be used properly, should be applied to the tissues gently without pressure, and floated through the tissues with a wiping motion quickly and precisely. Wyeth[13] aptly described it:

> One of the first things noted by the surgeon who seeks to employ the electronic knife in place of the scalpel is that with the former no pressure need be, or ought to be, exerted; light contact only is required, and we have a new sense of feeling the tissues separating as if of themselves before the tip of the small electrode. The operator directs the line of the incision; he does not by pressure, make it.

When regulation of the current output of the electronic surgical scalpel and proper instrumentation are combined with sound surgical biopsy technic, it is possible to obtain uniformly satisfactory specimens for biopsy safely, rapidly and efficiently with the electronic scalpel. Dr. Edward G. Winkler,[17] professor and head of the department of obstetrics and gynecology at the University of Buffalo School of Medicine, in referring to the use of

14. Ogus, W. I. Electrosurgery in dentistry. D. Digest 48:411 Sept. 1942.
15. Saghirian, L. M. Electrosurgical gingivoplasty. Oral Surg., Oral Med. & Oral Path. 2:1549 Dec. 1949.
16. Strock, M. S. Rationale for electrosurgery. Oral Surg., Oral Med. & Oral Path. 5:1166 Nov. 1952.
17. Winkler, E. G. Personal communication, 1954.

electronic electrosurgery in gynecology, stated: "Biopsies show a minimum of coagulation, and surface epithelium destruction is nil. Our pathologist concurs with this view."

Successful employment of electronic electrosurgery is founded on a sound surgical training and a careful study of the technics which have been developed. These methods cannot be learned completely in a week or a month. They call for careful attention to a relatively new technic, and for discriminating judgment in its application. Operators experienced in the use of electronic electrosurgery concur that removal, by electrosection, of tissue for biopsy is safe, efficient, that there is rapid healing and relatively little postoperative pain, and that the results are fully comparable diagnostically to the best results obtained by biopsy surgery with cold steel. Many of them have further noted that biopsy specimens obtained by electrosurgery with nonelectronic instruments are usually not equally satisfactory diagnostically, and that the resultant wounds are usually quite painful postoperatively and tend to heal slowly.

Visual evidence of the diagnostic effectiveness of biopsy specimens obtained by electronic electrosurgery should be much more convincing than the descriptive efforts of prose alone could be. For this reason a number of photomicrographs are offered in evidence as graphic demonstrations.

Figures 1-5 are photomicrographs of biopsy specimens obtained by electronic electrosurgery.

In Figure 1 is shown a specimen taken from buccal mucosa by electrosection. The only evidence of coagulation is a thin line along the outermost edges of tissue. Figure 2 is a biopsy specimen taken from buccal mucosa by electrosection. Mucin strands were unaffected by the heat of electrosection. In the specimen shown in Figure 3, a thin line along the outermost edges of tissue was the only evidence of coagulation.

Figure 4, of a mixed tumor, typifies specimens taken by electrosection which do not show even microscopic evidence of tissue coagulation. The mixed tumor capsule is intact except where it was torn by the microtome in slicing the tissue for mounting, and there is no evidence visible of tissue coagulation's having resulted from the resection by electrosection.

Figure 5, of an invasive squamous cell carcinoma, demonstrates a more or less opposite result. This photomicrograph typifies biopsy specimens of highly suspicious lesions that are too small to be sectioned by electrocoagulation but where a greater amount of coagulation than is normally obtained with electrosection is desired, as an added precaution. In these instances, increasing the current output and intensity slightly beyond the normal requirements results in visible surface coagulation of the tissue margins, but which is not in any degree destructive of diagnostic value of the biopsy specimen.

■ *Summary and Conclusions*

Two potential dangers are inherent in the removal of tissue for biopsy. Precancerous lesions may become activated to malignant change and malignant neoplasms can be stimulated to metastasis through hematogenous or the lymphatic channels. Students of cancer are in general agreement that biopsy is essential for

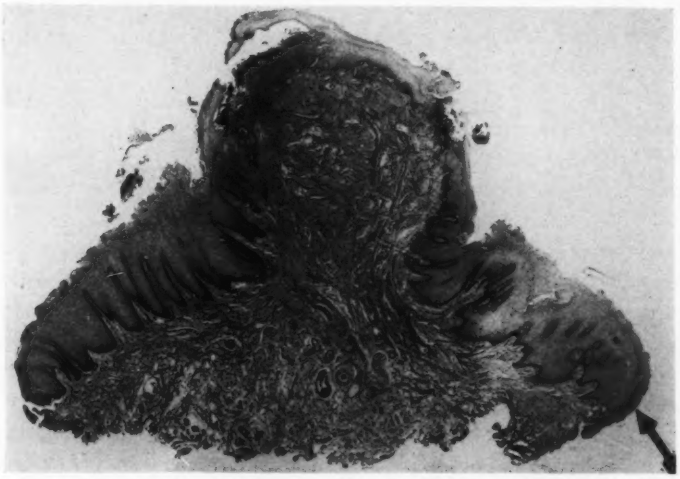

Fig. 1—Soft fibroma. Biopsy specimen taken from buccal mucosa by electrosection. Arrow indicates only evidence of coagulation which could be noted —a thin line along outermost edges of tissue. Note even tissue base produced by resection with loop electrode

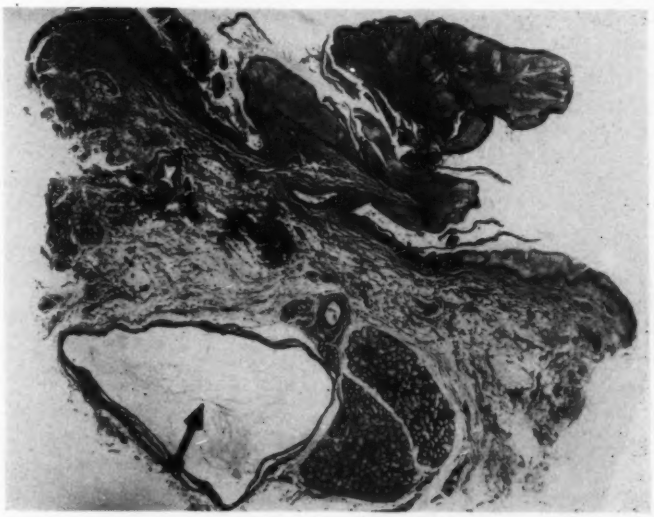

Fig. 2—Papilloma over a mucous cyst. Biopsy specimen taken from buccal mucosa by electrosection. Note mucin strands (indicated by arrow) unaffected by heat of electrosection

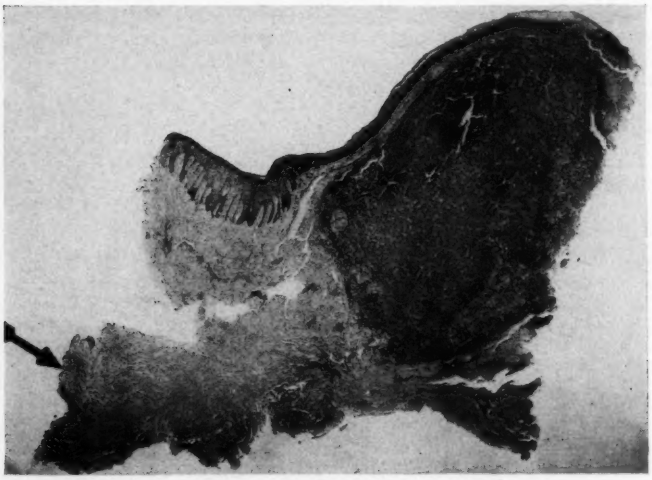

Fig. 3—Ewing's sarcoma. Biopsy specimen taken from mandibular gingival mucosa by electrosection. Arrow indicates only evidence of coagulation to be noted—a thin line along outermost edges of tissue

Fig. 4—Mixed tumor. Biopsy specimen taken from mucosa of retromolar region of mandible by electrosection. Note absence of evidence of coagulation

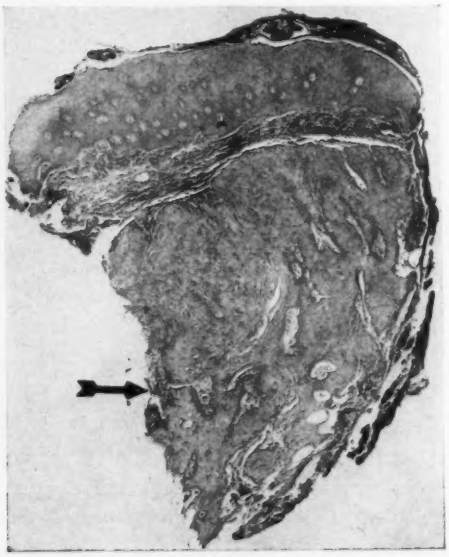

Fig. 5—Invasive squamous cell carcinoma. Biopsy specimen taken from floor of mouth by electrosection. Arrow indicates evidence of coagulation—a thin line along outermost edges of tissue

conclusive diagnosis of malignancy, and that the dangers noted are much more likely to result from inexperienced manipulation of the lesion rather than from the surgical procedure when it is carried out properly.

Despite the statistical incidence of oral cancer, clinically it is relatively uncommon, and many general practitioners never encounter it in a lifetime of dental practice. Because of unfamiliarity with oral malignant neoplasms and with the biopsy procedures, the average general practitioner is usually unqualified to attempt the removal of tissue for biopsy of suspicious lesions. When the general practitioner detects and clinically diagnoses oral cancer, he can then best complete his service by refraining from inexperienced attempts to obtain a biopsy specimen of the lesion, and by promptly referring the patient for conclusive diagnosis.

The age of the patient, history of the lesion, subjective symptoms, roentgenologic examination, blood examination and clinical observations are all valuable aids to diagnosis, but these alone are not always conclusive. Biopsy is almost always conclusive.

Coagulation of the tissues as they are being cut closes effectively the hematogenous and lymphatic channels for disseminating tumor emboli to distant parts, and thereby vastly increases the safety of the biopsy procedure. The electronic surgical scalpel provides a cutting current output called electrosection, which, when properly employed, is capable of effectively cutting tissue and sealing off the avenues of metastasis without impairing the diagnostic value of the biopsy specimen.

Failures due to faulty technic, or to improper equipment, should not be permitted to dissuade from the employment of electronic electrosurgery to provide a safe, efficient procedure for taking biopsy specimens that are diagnostically comparable to the best obtainable by other surgical methods.—22 *West 82nd Street.*

■ SCIENCE AND PROGRESS

Science, by itself, provides no panacea for individual, social and economic ills. It can be effective in the national welfare only as a member of a team, whether the conditions be peace or war. But without scientific progress, no amount of achievement in other directions can insure our health, prosperity and security as a nation in the modern world.—*Vannevar Bush.*

Chronic sclerosing osteomyelitis

■ *William G. Shafer, D.D.S., M.S., Indianapolis*

Bone, despite its dense, calcified nature, may react to injury in a dynamic, eruptive fashion belying the prevailing misconception that it is a fixed and static tissue. Under the stress of infection or trauma, the response of bone may be either destructive, constructive, or, in many instances, a combination of the two.

All the factors which determine the direction of bone response after injury are not known. It should be obvious, however, that there may be many modifying conditions which conceivably play a role in altering the reactivity phase of bone injury. In general, tissue resistance and degree of injury are influential in determining this response but other related factors such as the age of the patient, the blood supply to the part and extent of damage also are important.

The peculiar anatomic arrangement of teeth in the maxilla and mandible provides the basis for a unique opportunity for injuries not often found in other bones of the body. Conversely, it also might be expected that various reactions of the bone to injury would be seen here that would be considerably different from those more stereotyped responses occurring elsewhere in the body. Robinson[1] has characterized the variety of responses of bone to injury by the apt term of "osseous dysplasia."

One such unusual reaction of bone to injury occurring in the jaws is the condition known as chronic, sclerosing osteomyelitis. This type of osteomyelitis occurs in two forms, focal and diffuse. Whereas both focal and diffuse, chronic, sclerosing osteomyelitis are relatively common diseases, there is surprisingly little pertinent information in the available literature, particularly of the diffuse form, concerning their nature or treatment. Thoma[2] describes the condition under the term "ossifying osteomyelitis" in his text and, with Kalil,[3] has reported a case which is an example of the diffuse type.

The focal type of this form of osteomyelitis is most commonly exemplified by that condition called "condensing osteitis." This is an obvious misnomer since the condition is essentially a chronic osteomyelitis occurring in young persons at the apex of a tooth, usually a mandibular first molar, after carious exposure of the tooth. The response may be regarded as a proliferative reaction on the part of the bone in a person with high tissue resistance after periapical infection caused by microorganisms of comparatively low virulence. The dynamic reactivity of the tissues coupled with their high resistance prevents diffuse spread of the infection. Basically, the irritation occasioned by the infecting organisms is of such a low order that the connec-

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1. Robinson, H. B. G. Osseous dysplasia: reaction of bone to injury. J. Oral Surg. 14:3 Jan. 1956.

2. Thoma, K. H. Oral pathology, ed. 4. St. Louis, C. V. Mosby Co., 1954.

3. Thoma, K. H., and Kalil, F. H. Osteomyelitis of the jaws. Am. J. Orthodont. & Oral Surg. (Oral Surg. Sect.) 29:533 Oct. 1943.

tive tissue cells, including the osteoblasts, are stimulated rather than destroyed. As a result, bone actually is produced in response to the infection.

Diffuse, chronic, sclerosing osteomyelitis is a disease of a somewhat different nature although the pathologic process is basically the same. It is related to that disease described under the term "Garré's osteomyelitis," and reported by Pell and others[4] and by Thoma.[5] Garré's osteomyelitis, however, is periosteal in origin, whereas the disease under consideration here is endosteal in location.

Diffuse, chronic, sclerosing osteomyelitis is predominantly a disease of middle-aged or elderly persons, in contrast to the focal form. This fact may be accounted for by the decreased ability of tissues in older persons to contain or to limit infection as successfully as tissues in younger persons. Although the exact pathogenesis is unknown, it appears most likely that the condition is a result of a very slowly progressive, mild, chronic, nonspecific infection of bone resulting, as described, in stimulation of bone rather than destruction.

The condition occurs frequently in edentulous persons and, although usually involving the bicuspid and molar regions, may be found in any region. Not uncommonly the disease is bilaterally symmetrical.

The patient is symptomless in many instances, and the lesions are only discovered during routine roentgenographic examination of the jaws. On the other hand, the patient may complain of dull, poorly-localized pain in the jaw and, on occasion, a tiny fistulous tract is present from which a tiny drop of pus may be expressed. Mild expansion of the jaw may occur, but this is rather uncommon.

The roentgenographic picture is an unusual one showing a diffuse "cotton-wool" sclerosis of the bone, often involving a considerable portion of the jaw. The sclerosis may extend to the crest of the ridge and even cause some apparent elevation of the ridge. There is no tendency for a "walling-off" of the sclerosis, and it appears to blend into the surrounding bone on the periphery.

Histopathologic examination of a specimen from an affected area reveals osteosclerosis and irregular proliferation of viable bone. The interstitial connective tissue is often somewhat more fibrous than usual and is typically infiltrated by small numbers of lymphocytes and plasma cells.

The treatment of diffuse chronic sclerosing osteomyelitis poses a difficult problem. Surgical excision of the involved areas is obviously out of the question because of the extensive nature of the disease. Drainage is seldom necessary since the disease, in its typical chronic state, is a nonsuppurative one. Cyclic acute exacerbations are relatively common, however, and when the condition does become suppurative, antibiotic therapy is indicated. The condition does not tend to regress and seldom does the bone remodel itself to show a normal pattern.

■ *Report of Cases*

CASE 1—A 53 year old woman entered Indiana University School of Dentistry diagnosis clinic with a chief complaint of

4. Pell, G. J., and others. Garré's osteomyelitis of the mandible: report of case. J. Oral Surg. 13:248 July 1955.
5. Thoma, K. H. Garré's osteomyelitis of the mandible. Oral Surg., Oral Med. & Oral Path. 9:444 April 1956.

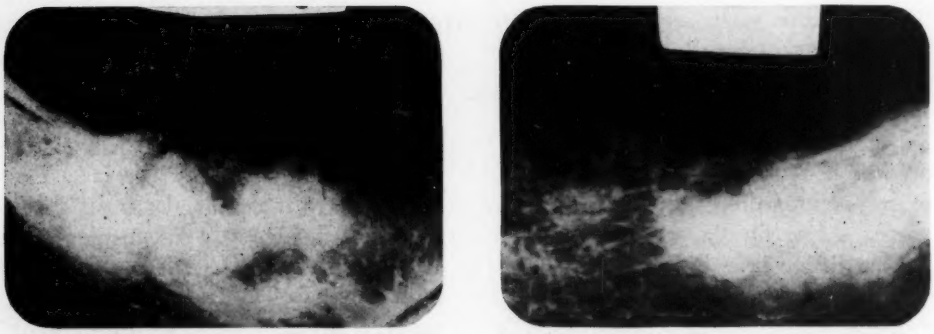

Fig. 1—Case 1. Left: Intraoral view of left mandibular molar region shows diffuse osteomyelitis sclerosis. Right: Similar view of right mandible shows same type of bone reaction

an area of chronic suppuration of the left side of the mandible in the bicuspid-molar region beneath her denture. The patient stated that she had noted drainage from this region for "quite awhile." She had worn dentures for approximately ten years and within the past five weeks had experienced pain which she described as similar to a toothache.

Intraoral examination revealed a tiny fistulous tract on the crest of the mandibular alveolar ridge from which could be expressed a small bit of pus. Roentgenographically, diffuse areas of radiopacity were noted in the bicuspid and molar region of both sides of the mandible (Fig. 1 and 2). A biopsy specimen was taken through one area of sclerosis (Fig. 3).

CASE 2—A 70 year old woman visited Indiana University School of Dentistry diagnosis clinic with a vague complaint that "her gums had been bothering her"

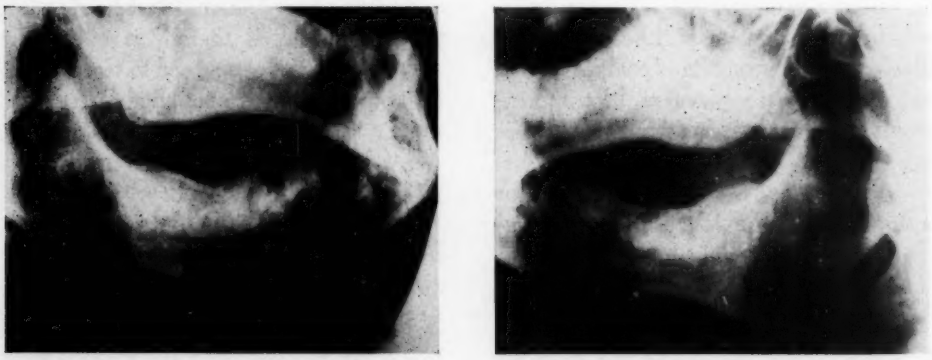

Fig. 2—Case 1. Left: Lateral jaw roentgenogram indicates extent of sclerotic area. Right: View of opposite side of jaw demonstrates similar but less extensive condition

for approximately one year. The patient had been edentulous for 14 years. Intraoral examination revealed a region of exposed nonviable bone in the anterior portion of the mandibular ridge extending from the region of the right lateral incisor to that of the left lateral incisor. Roentgenographic examination revealed diffuse areas of sclerosis in the right and left mandibular molar regions (Fig. 4) similar to that in Case 1.

Sequestrectomy of the exposed nonviable bone was carried out, but no attempt was made to treat the diffuse sclerotic areas in the posterior portions of the jaw.

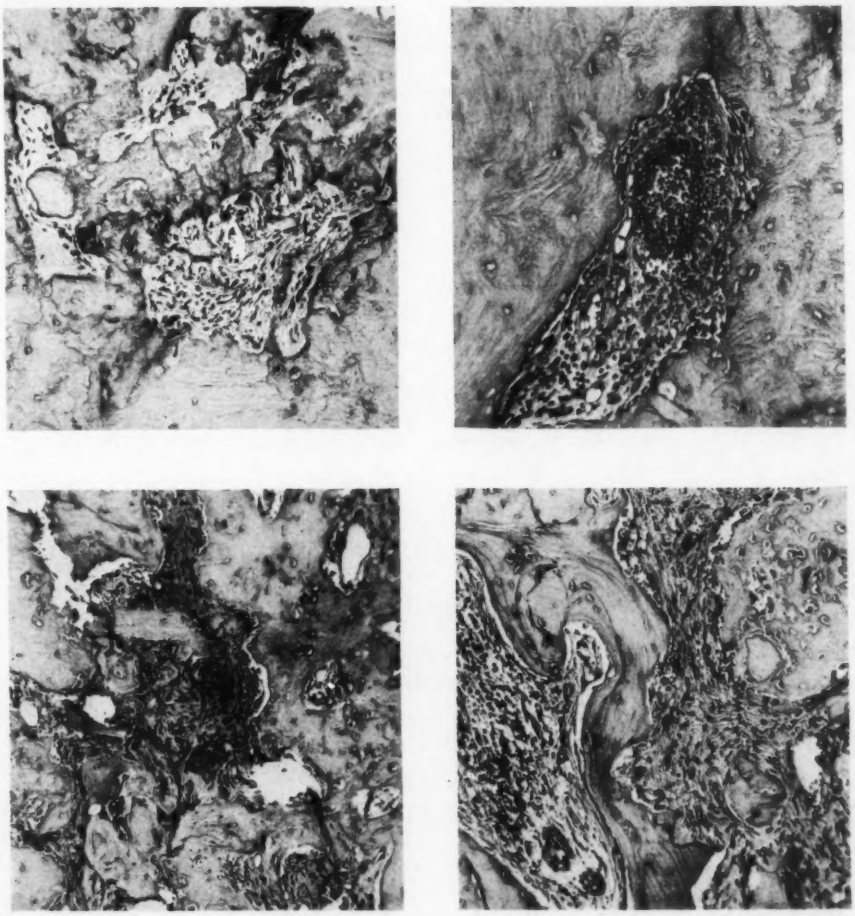

Fig. 3—Case 1. Sections from various areas of biopsy specimen reveal irregular nature of new bone formation, evidence of mild resorption, fibrous appearance of supportive connective tissue, viability of bone and mild chronic inflammation

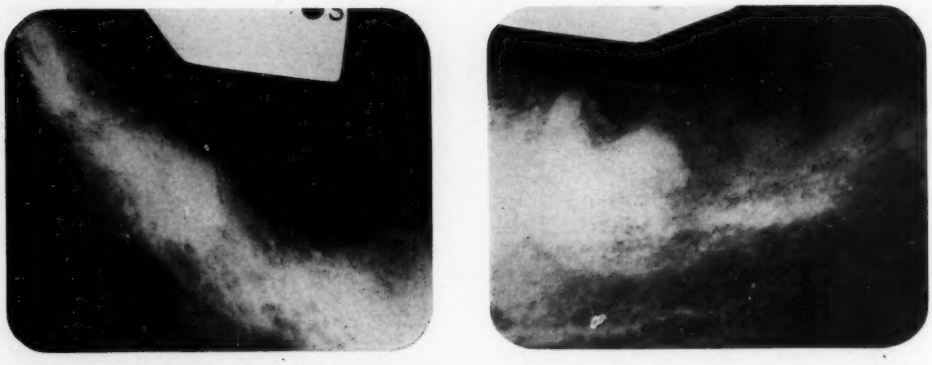

Fig. 4—Case 2. Left: Intraoral view of molar region of left side of mandible shows diffuse sclerosis similar to that in Case 1. Right: Opposite side of mandible also shows diffuse chronic sclerosing osteomyelitis

■ *Summary*

1. Chronic, sclerosing osteomyelitis is a form of infection characterized by the production rather than destruction of bone and is an expression of the dynamic manner in which bone may react to a mild injury.

2. The disease may be discovered during routine roentgenographic examination of the jaws or, as in the two cases reported, vague clinical symptoms may cause the patient to seek treatment.

3. There is no definitive treatment to be offered because of the usually diffuse nature of the disease, although antibiotic therapy is indicated during acute exacerbations which occur occasionally.

An analysis of business procedures

■ *Victor H. Frank, D.D.S., Philadelphia*

The primary concern of all dentists is to render the highest possible degree of professional service. This entails continual study of the basic sciences and an inquisitive and discerning approach to all problems in a desire to develop the greatest potential of mind, ability and dexterity. In addition to this, the efficient office and personnel contribute in no small measure to good professional service. Accumulation of statistics and good basic bookkeeping methods are essential. The tax laws necessitate not only an accurate record, but a careful control of expenses so that

professional efforts may be fully rewarded. Incorporating sound procedures will not only make the dentist aware of where his expenses are, but will also show him ways to make legitimate savings.

The purpose of this article is the following:

1. To enumerate briefly various business procedures that work for me, and in so doing, give some of my own figures and percentages. These in no way will invade the privacy that all of us like to maintain.

2. To convince oral surgeons that keeping statistical records helps them in several ways:

a. They will know their own costs on various components of their work.

b. They can evaluate advantages of more assistance, or of a greater capital investment.

c. They can evaluate technics and procedures.

d. Frequently the dentist will be made aware of a problem, and just as frequently he will be helped to solve it.

■ *Expenses and Percentage of Overhead*

It is realized that expenses, and particularly overhead, will vary considerably. It is possible, however, to show some common denominators so that by the analyzing of costs, the average charge per patient and the dentist's income tax bracket, his own point of diminishing returns can be ascertained. For the man starting out in a specialty, percentage of overhead is of no practical value. His overhead is usually out of proportion, for with the same costs, he could do several times the volume of work. His yardstick should be the average fee per case. When his volume approaches what he considers a normal working day, he may then apply the other figure, namely, percentage of overhead. On the other hand, the specialist who has an established practice can compare both figures. If a so-called normal percentage of overhead is to be arrived at, this "normal" must take into consideration the following factors:

1. One man offices present a different problem from multiple man offices.

2. What is the minimum office personnel needed?

3. Would an increase in personnel enable the dentist to operate more efficiently, and if so, after taxes, how much does it cost?

4. What is the dentist's present percentage of expense to volume?

These factors will not be explained completely, for anyone interested can work out his own problem. In order to give a figure for comparison, I would like to give my own percentage of expense to volume for 1953—34 per cent. It should be noted, however, that the following factors and items are not included in the 34 per cent: (1) depreciation; (2) convention trips; (3) entertainment and (4) automobile. Naturally if these items were added, my percentage of expense would increase. It is to be emphasized that these four are all legitimate expense items for income tax statement. They are so variable for each man, that if they were included, it would be difficult to arrive at a comparable figure for any individual.

■ *Deductible Items for Income Tax Purposes*

In no way am I posing as a tax expert. My observations are the accumulation of years of experience with my own income tax returns as well as conversations with other professional men. Consultation with an accountant or tax expert is essential and helpful. However, many of these experts do not know the demands of an oral surgeon and therefore may not suggest some allowable deductions.

Depreciation, convention trips, entertainment and automobile are for the most part not recorded regularly on the business expense books of the oral surgeon. They are deductible items and their validity is verified by accurate records.

A man whose highest tax bracket is 50 per cent is used for illustration. His net income is $24,000 if single and $32,000 if married.

DEPRECIATION—If equipment still is being depreciated or if considerable improvements have been made within the prior ten years, the depreciation figure will be high. (The normal time allowed for depreciation is ten years.)

It is possible to show briefly why it is advantageous to refurnish or to modernize an office, especially if such work is needed. If an individual modernizes his offices (surgical, reception or business) and spends $10,000, he is allowed to deduct $1,000 a year for ten years. The comparison can best be shown by the following: If a man keeps $10,000 in capital, his interest at 5 per cent would be $500. A 50 per cent tax rate takes $250. The investor thus has his capital and $250 a year interest. On the other hand, if the dentist invests $10,000 in his office, he can deduct $1,000 a year. This deduction saves taxes of $500 (at the 50 per cent tax rate). He adds to this the remaining $500 which is extra income. The dentist recovers the $10,000 in ten years, plus the compounded interest on the extra $1,000 a year for nine years.

If the dentist borrows the $10,000 at 3 or 4 per cent interest, the aspect is more favorable. He does not lose the interest of $500 (or $250 net after taxes) on his capital and, furthermore, he can deduct the $300 or $400 paid on his indebtedness. The present tax structure encourages expenditures for modernization, and there should be no hesitancy in making capital expenditures.

CONVENTION TRIPS—Some professional men go to more conventions than others; also, there are those who combine their vacations with these business trips in order to conserve taxes honestly and legally. The Government, of course, allows deduction of expenses to and from and during a convention.

ENTERTAINMENT—Entertainment is another item that varies greatly. Professional entertainment has many ramifications, and everyone should investigate this phase of their profession. My own experience with the Bureau of Internal Revenue is that they are reasonable if claims can be substantiated with figures. In trying to find allowable percentages, I have asked men in other professions if they could tell me their percentage for entertainment. The answer was "no," since the percentage was variable and had to be substantiated. In a specialty such as oral

surgery, where so much of the work is referred, professional entertainment is considered normal.

AUTOMOBILES—Travel strictly concerned with professional work is deductible. With the hospital work all oral surgeons have, transportation is essential. Most successful men will find it advantageous to have two cars: one for family use, and one for professional use, the cost and expense of which is totally deductible. If the automobile used for professional purposes cost $4,000, then using a four year depreciation, it is figured that $1,000 per year is deductible. At the 50 per cent tax bracket, this saves $500 in taxes.

The four items have been elaborated because their inclusion in my percentage of expense would increase it considerably. With these items excluded, a more stable figure is given so that it can be compared.

■ *Average Fee per Case*

As mentioned previously, the average fee per case is a good yardstick for the oral surgeon starting in practice where he cannot estimate a correct percentage of expense to volume. It is also of value to the well-established office for the following reasons:

1. If a change in anesthetic agent and technic is contemplated, the cost of drugs, supplies and personnel can be estimated to establish what costs per case will be.

2. A yearly comparable figure will be available to show if an increased or decreased gross is due to the volume of work, or a changed fee schedule.

The average fee per case is determined by dividing the total number of cases for a year into the gross for the year. This average can be variable for many reasons. Some practices have higher fees; others have a higher percentage of difficult operations. A third example of higher fee per case occurs when the surgeon performs all the necessary surgery at one appointment. This tends to increase the average fee per case in most instances.

■ *Office Suggestions*

In my office, four different types of records are used. They are as follows:

1. Day sheets (balancing and discounting).
2. A doctors' file.
3. A graph to show the flow of work.
4. Records of sutures, dressings and biopsies.

DAY SHEET—A day sheet should be used to keep a day-to-day record of patients operated on, charges entered, monies collected and outstanding accounts paid (Fig. 1). It is simple and uncomplicated and will give a complete record of the following:

1. Number and name of patients seen, with records of charges made and monies collected from them.

2. Record of outstanding accounts so that the office secretary can secure a list of patients to whom bills should be sent. (Many offices secure this list from a file of patients' cards.) This method gives an additional check on such a file.

3. A simple method of balancing daily and monthly.

4. A method to discount uncollectible accounts.

This keeps the books completely accurate and reflects all details.

DOCTORS' FILE—A visible file (3 by 5 inch cards), 7 inches high and 7½ inches wide, is kept on the secretary's desk. It has a capacity for 500 cards and 1,000 names if both sides are used. For most offices, all active referring doctors can be listed in a file this size. The secretary writes the address of the referring doctor on an envelope to send out the acknowledgement card. It requires only a moment's extra work to write either the date or the case number and the charge made on this card. With five vertical lines, there is room for 50 entries on a side. At the end of the year, a line is drawn under the last entry and the total number of cases and charges for the year are entered below this line (Fig. 2).

Some purposes for these figures are:

1. A record of the amount of work referred by the professional associates.
2. An accurate record of the regularity and frequency of referred patients from any one man.
3. If all cards are added and the total is compared with the gross volume, the percentage of referred work can be obtained. (After a number of years this percentage will probably be around 50 per cent from satisfied patients and friends and the remainder from professional associates.)

GRAPH SHOWING FLOW OF WORK—The procedure used in making a graph showing the flow of work is simple. The charges or money collected, or both, is plotted on graph paper on a monthly basis

Saturday, April 24, 1954

No.	Name	Reference	Charge	No. teeth ext.	Detail of charges	Credits		
						Today's cash	Balance	Paid balance
188231	Magnet, Mrs. Russel		10	1		10		
188232	Williams, Mrs. Harold	Smith	8	1		8		
188233	Zeitz, Mrs. Sadie	Jones	8	1		8		
188234	DiCamillo, Mrs. Frank		15	2		15		
188235	Prestogord, Selmar	Jones	35	2		35		
188236	Ludden, Mrs. Frank		10	1		10		
188237	Minter, Mr. Carl	Brown	10	1		10		
	Desch, Mrs. Edward	TO GRADUATE HOSPITAL ON 3/2/54						
	Echenoff, Mr. A. G.				1/16/54	15		15
	Joslow, Shelly				11/26/53	10		10
				FM				
			60	8		60		
188242	Amoroso, Mrs. Andrew			2		15		
188243	Bosch, Miss Eileen							
188244	Grier, Miss Sarah		10	1				
188245	Stein, Mrs. Raymond			1	(MD)			
188246	Weyl, Mrs. Elinor		8	1		8		
188247	Weiner, Mrs. Ruth		25	4		25		
							2/27/54	
188248	McClellan, Mrs. F.		10	1			10	
188249	Schansky, Miss Roslyn		8	1			8	
Total	19 patients		283	34		290	18	25

Fig. 1—Sample from day sheet

(Fig. 3). This will give the following information visually:

1. Any definite trend in the fluctuation of work on a monthly or annual basis.

2. The period of the year that is best for a vacation.

My own graph shows that July, August and the last half of December are lighter than the rest of the year. If this record were kept throughout the country, the most satisfactory time to be away from the office for conventions and vacations could be evaluated.

■ *Methods Used to Check Sutures, Dressings and Biopsies*

Originally in my office I noted information concerning sutures, dressings and biopsies on the patient's record card. If they did not return for treatment, there have been instances where the sutures were not removed, or where dressings were left in much longer than desired.

This procedure has been changed so that the secretary now has three cards on her desk. They are ruled with columns with the following headings on each card:

Card 1. Patient's name, date, number of sutures, date removed.

Card 2. Patient's name, date, type of dressing, date removed.

Card 3. Patient's name, date, biopsy diagnosis, report received, doctor notified.

It is now a simple matter for the secretary to check the patients who fail to return at the proper time for removal of sutures or dressings. In instances in which biopsies are obtained, the referring doctor and the patient are promptly notified of the results.

1950

16	136	67168	10	4/26	20	9/16	10	1953	
1951		67282	5	5/3	40	9/30	20	1/19	10
36	452	67334	10	5/9	15	10/25	20	1/26	10
1952		67370	40	5/16	6	10/31	12	1/31	10
66616	10	67415	16	5/22	10	11/21	15	2/24	10
66832	60	67616	10	6/11	50	12/1	10		
66883	8	67832	60	6/18	10	12/17	10		
66889	20	67883	8	8/27	10	12/22	10		
67118	10	67889	20	9/2	10	12/30	10		
67164	50	68118	10	9/8	10	35	645		

Doe, John 1800 Pine St. (3) PE. 5-1800

Fig. 2—Sample card from doctors' file

■ *Records Used in Solving Problems*

If a habit of keeping good records is developed with the thought of accumulating this information for future use, many problems encountered in the daily routine become clarified and the statistical record enables easy periodic evaluation to aid in the solution of a problem.

As an illustration of the use of statistics, an accurate record of the occurrence of paresthesia after removal of an impacted lower third molar can be maintained. Such records can be used in periodic evaluation of technics and results and can aid in possible revision of methods and development of active treatment for this bothersome affliction.

■ *Achieving an Appointment Practice*

The problem of achieving an appointment practice is a continual one in most practices. My records show that only 53 per cent of my patients make an appointment 24 hours or more in advance. Most of the balance make appointments on and for the day they are seen. This

accounts for 39 per cent; the remaining 8 per cent casually drop in without an appointment. Of course, there are always a number of broken appointments, largely because of inclement weather or emergencies. These instances are not included in the given percentages.

A simple method of obtaining these percentages is as follows: All future appointments are written in pencil in the appointment book. If a doctor or a patient calls for an appointment on the same day, their name is written in red. The total of these appointments (those in both black and red pencil) subtracted from the number of patients seen that day gives the number of added patients without appointments. To combat this situation the referral cards should include a note asking the patient to telephone for an appointment prior to coming in.

■ *Inventory Controls*

The procedure for inventory controls has always sounded rather complicated but actually it can be simplified considerably. For example, in my office about 14 kinds of printed matter are used. A large 15 column sheet is used for this record utilizing one column for each item. The date, price and the amount purchased are recorded. When reordering, price is compared and also length of time the supply lasted. It usually is not practical to buy more than a two years' supply, although on some items not used extensively, a

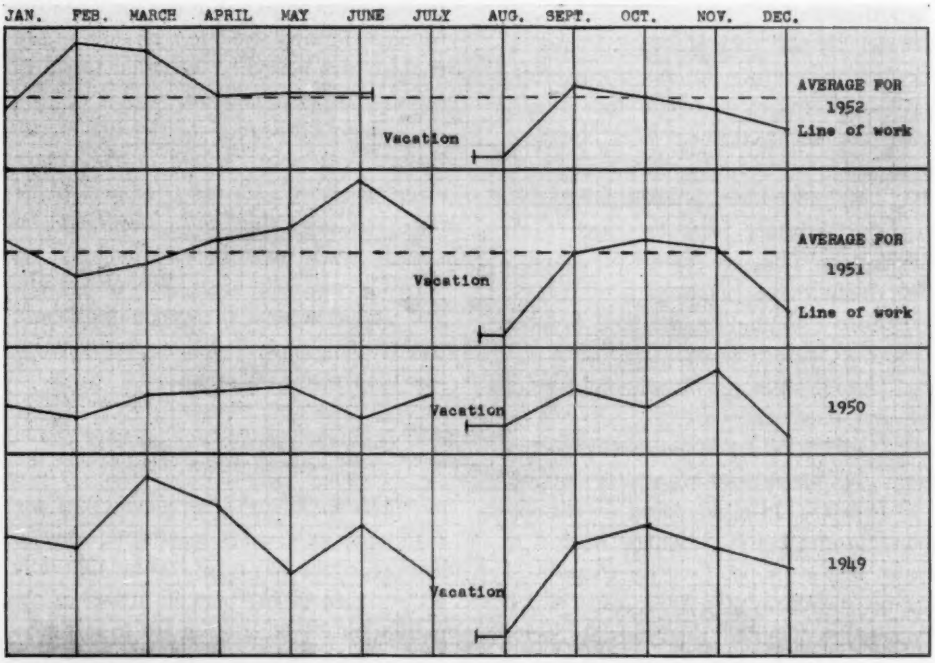

Fig. 3—Graph showing flow of work

three years' supply may be purchased. This sheet is a ready comparison file.

Determination of the most advantageous quantity to buy can be done by formula. The saving in price of a larger quantity necessary for one additional year is compared to the investment or use of that money for the time of use for the smaller order. For example, if 5,000 sheets of printed matter are used each year and the cost of 10,000 sheets is $5 per thousand, the cost is $50. If 15,000 are bought, the cost might be $4.50 per thousand or $67.50 for three years. Using the above formula, it can be seen that $17.50 is invested for the first two years on which interest is lost, at, for example, 5 per cent, or $1.75. In other words, the total outlay will be $76.50 plus $1.75 or $69.25 as compared to $75. The other factors to evaluate this with are the following:

1. The possibility of loss through water or dirt damage.
2. The lack of proper storage facilities.
3. A possible desire to change stationery.

Other factors may be involved, but business acumen should be exercised. As an example, since the income tax was reduced for 1954, it was definitely good business practice to increase inventory in 1953. On items such as thiopental sodium, this produces a definite tax saving.

An efficient secretary-receptionist should be capable of doing the following:

1. Keeping day sheet and balance daily and monthly.
2. Send out bills and enter them when paid.
3. Keep a doctors' file in order and send acknowledgements of work referred, if desired. These doctors' cards are added at the end of the fiscal year.
4. Receive and dismiss patients with proper instructions.
5. Make appointments.
6. Keep an independent record at her desk of these items:
   a. Patients with sutures.
   b. Patients with dressings.
   c. Biopsies and notification of the referring doctor and patient of the findings.
7. Keep records of expenses and have an inventory control system.

■ *Conclusion*

It should be emphasized that professional competence and the ethical treatment of patients are of primary importance. The utilization of sound business methods, however, can and does produce tax savings.—*1800 Pine Street.*

■ Growth of Understanding

The deeper insight man has into the affairs of nature, the more he discovers the accurateness and art of the creation, the more he will understand the contexture of all things.—*Sir Thomas Pope Blount (1693).*

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CASE REPORTS

Ameloblastoma of the mandible: *report of case*

■ *Charles C. Alling, D.D.S., M.S., El Paso, Texas*

Ameloblastoma has a noticeable tendency to recur; however, in some instances the condition appears to be amenable to local excision. In the following case, the condition was treated with intraoral excision and enucleation, and after one year the architecture of the mandible had been restored to normal appearance in roentgenograms.

CHIEF COMPLAINT—The patient was aware of a tumor of the left side of the mandible that had been examined roentgenographically, and she appeared for treatment at the University Hospital, Ann Arbor, Mich., in November 1952.

HISTORY—In 1950 there had been a bony nodule about the size of a pea palpable by the patient on the lateral aspect of the left side of the mandible near the angle. By April 1952, the nodule had become a tumor. In October, the area had been incised and drained by the local physician. The fluid obtained was clear in color. The drainage had persisted, and as it and the tumor did not respond to palliative measures, roentgenograms had been obtained. The roentgenographic report was in part, "The differential diagnosis would appear to rest between a primary or metastatic carcinoma. Ewing's sarcoma might produce a similar finding in this area."

The past medical history was essentially noncontributory. The dental history was one of meticulous care both professionally and by the patient. The teeth in the posterior part of the left side of the mandible had been missing for 10 or 15 years. The patient did not have a partial denture.

PHYSICAL EXAMINATION—The patient was a well-developed, well-nourished white woman, aged 52. There was no apparent abnormal habitus. Extraorally the posterior left side of the lower middle third of the face appeared to be slightly swollen over the angle of the mandible. There was a moderate lymphadenopathy of the middle and posterior submaxillary nodes. There were no palpable cervical supraclavicular or axillary nodes.

Intraorally the mouth appeared to be well cared for, though some teeth were missing. There was no gross abnormality of any of the remaining teeth or soft structures, except for considerable expansion of the body of the posterior one third of the mandible on the left side. At the site of the previous incision there was a copious drainage of a moderately thick, purulent, yellowish fluid.

ROENTGENOGRAPHIC EXAMINATION—Multiple films of the jaw disclosed an expanding lesion just anterior to the angle of the mandible on the left side (Fig. 1). This had eroded the alveolar margin at its superior aspect and the cortex on the lateral surface of the mandible. The lesion was irregular and multilocular in appearance, and it measured almost 4 cm. in diameter. There were no retained root frag-

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ments in this area, and no evidence of any foreign body.

TREATMENT—On admission the patient stated that she felt well and had no pain. On November 17, the area was opened intraorally through an approach on the crest of the alveolar ridge extending posteriorly up to and through the attachments of the temporal muscle on the anterior aspect of the coronoid process. The cystic lining was found to be firm in character, grayish-white and varying from 0.5 cm. to 2 mm. in thickness. This cystic lining was enucleated. Four or five accessory defects were noted, and the lining was enucleated from them. The bony defect was treated with a phenol rinse followed with an alcohol rinse and finally a normal saline solution rinse. The bony defect was packed with petroleum jelly gauze.

The pathological diagnosis was "ameloblastoma or adamantinoma which is both solid and cystic. Severe chronic purulent inflammation. Reactive new bone formation."

The postoperative course was quiet. The gauze dressing was changed during the patient's stay in the hospital, and the defect was irrigated with normal saline solution. The patient was not experiencing undue pain. She was discharged from the hospital to the care of the referring dentist.

OUTPATIENT COURSE—Clinical examination on the twenty-fourth postoperative day revealed epithelization of the defect. The patient was comfortable and without complaint.

By May 12, 1953, there was a palpable bony mass on the left lateral surface of the mandible in the region of the anterior aspect of the ascending ramus. The mass extended obliquely toward the base of the mandible. Roentgenographic examination revealed changes incident to the surgical procedure with an ill-defined area on the anterior aspect of the mandibular ramus that represented incomplete repair of bone. Complete repair of the intraoral aspect of the incision line and operative site had occurred.

One year postoperatively, examination revealed the roll of bone on the anterior aspect of the ramus extending to the inferior border of the mandible to be decreased considerably in size (Fig. 2). The roentgenographic report read in part "There has been more filling in of the defect since previous examination of

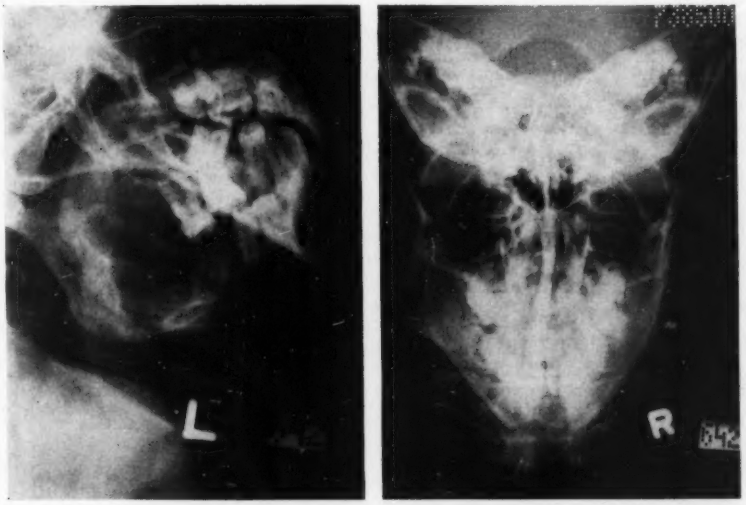

Fig. 1—Preoperative status of ameloblastoma

Fig. 2—Postoperative repair of mandible one year after removal of tumor

May 12, 1953, but osseous architecture of the mandible appears normal and there is nothing to suggest recurrence of the adamantinoma."

COMMENT—Ameloblastoma is an epithelial tumor arising from an odontogenic anlage. The term ameloblastoma has been accepted by the American Academy of Oral Pathology and was first suggested by Ivy and Churchill.[1] Diagnosis may be indicated by the slow asymptomatic growth, the lack of infiltration and fixation of surrounding soft tissues, the well-defined outlines of polycystic central tumors, but the final diagnosis must await histologic examination of the tissues.[2]

In the management of ameloblastomas, two schools of thought exist, one advocating local excision[3, 4] and the other a so-called radical resection.[5-7] In agreement with Byars and Sarnat,[8] many workers feel that conservative treatment is the method of choice unless contraindicated by extensive, inaccessible involvement.

In the case reported, the initial wide involvement could have been an indication for a resection, but it was determined to attempt conservative removal with the hope of obtaining some bone regeneration. If the tumor recurs, further removal can be carried out with conservation of some semblance of a mandible. The initial success of this case should not relax the vigilance that is necessary to detect any recurrence. The patient is to be seen biannually for clinical and roentgenographic examinations.

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3. Bloodgood, J. C. Central lesions of the lower jaw, their recognition and treatment in the earliest stages, J.A.D.A. 20:1996 Nov. 1933.

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Antral rhinolith: *report of case*

■ *C. Jay Brown, Jr.,* D.D.S., and Robert E. Allen,* D.D.S., M.S., Kansas City, Kans.*

The occurrence of rhinoliths, according to available literature, is relatively rare. Abu-Jaudeh[1] states that a little over 300 instances have been reported. Snyder and Feldman[2] found that less than 40 cases were reported between 1916 and 1936. Three cases have been reported by Gilbert,[3] Sweet,[4] and Seidel.[5] In considering the reported incidence of this abnormality, it must be kept in mind that many instances have been treated but not reported, and that others have not been diagnosed as such.

Lithic changes in the maxillary antrum are even less frequently observed. Lord[6] found reports of six cases; only one of these reports was in English. The first of these was reported in 1686 and the second in 1738. Steele[7] and Wilson[8] each operated on a giant antral rhinolith, reports of which are being prepared at this time. Cunningham and co-workers,[9] in reporting an instance of antral rhinolith, found 13 recorded in the literature at that time. As far as we could ascertain, none have been reported since.

Lithic changes, both antral and nasal, are found to be of two types, true or false. The true stone is formed around an endogenous nucleus; that is, red blood cells, pus cells, and so on. The false type forms around exogenous nuclei such as bits of paper, string, roots of teeth and other foreign bodies. Snyder and Feldman[2] state that most of these concretions are of the former type. Deviations in the normal intranasal and antral anatomy are also causative factors. When these variations produce a stasis, with resultant concentrations of inorganic salts, the possibility of nasal and antral calculi being produced is enhanced.

The inorganic salts which comprise these stones are as follows: calcium phosphate, 43.7 per cent; calcium carbonate, 21.8 per cent; organic matter plus moisture, 33 per cent; undetermined constituents, 1.5 per cent. These constituents are derived from the nasal and lacrimal secretions. Polisar[10] states that most inorganic salts are derived from the lacrimal secretions. The consistency of rhinoliths varies; they may be hard, brittle, friable, soft, porous or crumbly.

Snyder and Feldman[2] state that these stones frequently may be covered with granulation tissue. The color may vary from black through browns, grays and lighter shades. The shape will conform to the space in which the rhinolith is developed.

As has been stated previously, rhinoliths occur much more frequently than antral calculi. Any part of the nose may be involved, but the lower part of the chamber is the most frequent site. When this disease is present, the following conditions may be observed: unilateral or bilateral nasal obstruction, foul nasal discharge, epistaxis, fetor oris, pressure atrophy of adjacent structures and possible sinusitis on the involved side. When this disease is encountered, differential diagnosis should include

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9. Cunningham, A. T., and others. Rhinoliths: report of antral and three nasal stones. J. Laryng. & Otol. 60:253 June 1945.

10. Polisar, J. M. Rhinolithiasis: report of three cases. Laryngoscope 43:658 Aug. 1933.

the following: syphilitic sequestrations, calcified polyps, osteomas, necrotic bone, malignancies and odontomas of the maxillary area. Lobell[11] has stated that roentgenographic observations are of no value in this differential diagnosis.

The size of the nasal and antral concretions may vary from a few milligrams to a giant rhinolith of 116 Gms. as reported by Abu-Jaudeh.[1] This disease has been noted in patients from 6 to 69 years of age (Snyder and Feldman[2]) and as far as can be ascertained, no malignancies have been associated with this lesion.

REPORT OF CASE—On May 10, 1952, a 25 year old white woman was referred to our office for diagnosis. The patient had no complaint; however, her dentist, in routine dental roentgenograms, had discovered a radiopaque object in her maxilla (Fig. 1) which had not been demonstrable in exposures that had been taken one year previously.

PHYSICAL EXAMINATION—The physical examination was negative for pathologic changes in all systems.

The patient was referred to a roentgenologist for studies of the head. The following report was given: "X-ray examination of the paranasal sinuses shows the left frontal sinuses well developed and air contained. The right frontal sinus is small. There is a persistent metopic suture. The right maxillary sinus is clear. The left maxillary sinus presents a dense opacity somewhat irregular in outline, believed to represent an odontoma (Fig. 2). This lies directly above the left upper premolar and is located within the maxillary sinus. There is no evidence of bone erosion. The nasal septum is deviated slightly to the right. The ethmoid and sphenoid cells are clear. The diagnosis is odontoma, left maxillary sinus."

11. Lobell, A. Rhinolithiasis: report of two cases. Laryngoscope 37:337 May 1927.

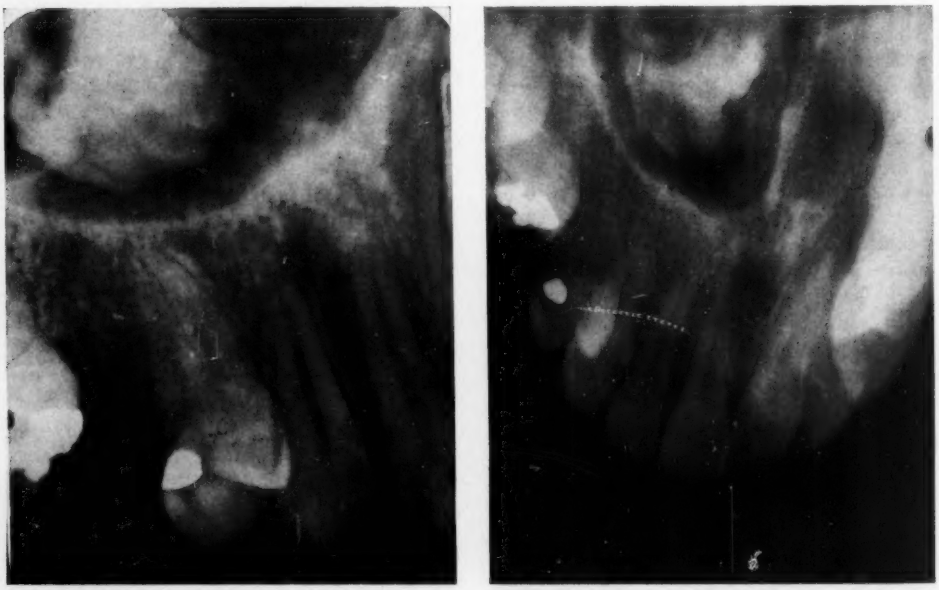

Fig. 1—Intraoral roentgenograms of original tumor mass

PROCEDURE—The patient was hospitalized on June 23 for surgery on the following day. On June 24, the patient was anesthetized with thiamylal sodium and a nasoendotracheal tube was passed through the right nostril. Anesthesia for the remainder of the operation was maintained with nitrous oxide-oxygen.

The patient was then prepared, draped, and the throat and nasal pharynx packed with gauze. An incision was made through the mucoperiosteum from the midline of the maxilla posteriorly to the left maxillary tuberosity 0.5 cm. above the gingival margin. This flap was reflected superiorly and the anterolateral surface of the maxilla was exposed. It was found to be normal in appearance.

An opening was made with mallet and chisel well above the apexes of the bicuspids and molars into the maxillary antrum. This opening was then enlarged with Kerrison forceps until the sinus could be well visualized.

The schneiderian membrane was thickened and edematous with some polypoid degeneration. A specimen was taken from four different regions of the antrum for histopathologic examination, and three small polyps were removed.

At the inferior medial wall of the maxillary sinus, a blackish green lithic mass with an irregular surface, was found. The mass was 2 cm. in lateral dimension and did not adhere to the bone. A thin wall of tissue separated it from the antral wall. The mass could be moved in its bed but could not be dislodged, as it obviously penetrated the medial wall of the antrum and was larger on the nasal side.

The portion of the mass seen in the sinus was crushed with chisels and removed in small pieces. The remaining portion of the stone lay within the nasal cavity. This piece could be forced internally and visualized in the inferior meatus. It was too large to deliver intact, however, and therefore was crushed and delivered through the anterior nares. The communication opening was then enlarged to form a new low window. The antrum was lightly dressed with chlortetracycline-impregnated gauze through the nasal window. One end of the dressing was taped to the face. The oral incision was closed with no. 000 silk sutures.

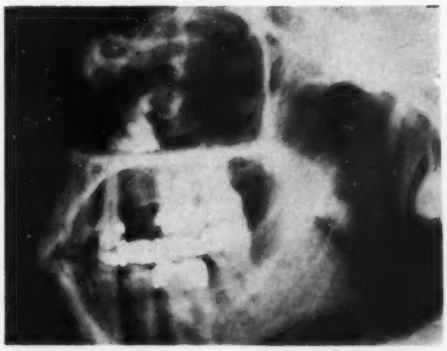

Fig. 2—Lateral exposure of head, showing original tumor mass

There was considerable postoperative edema and ecchymosis. On the fourth postoperative day, the antral dressing was removed through the nasal window and the patient discharged from the hospital. Antibiotic therapy was continued for one additional week. Follow-up examination revealed healing, drainage and ventilation of the antrum to be adequate. Final diagnosis was nasoantral rhinolith.

COMMENT—The patient described herein had an antral rhinolith, probably of the true type, that had formed around an endogenous nucleus. The preoperative diagnosis, based on the comparative opacity of the lesion, was odontoma. It is interesting to note that the lesion developed in one year, which is not compatible with the formation of an odontoma. In the roentgenographic interpretation of opaque changes about the maxillary sinus, the possibility of lithic change should be considered.—672 *New Brotherhood Building.*

Skull tongs in craniomaxillary fixation: *report of case*

■ *Gerald H. Bonnette,* D.D.S., Pensacola, Fla., and Jose L. Garcia-Oller,† M.D., New Orleans*

Conventional technics and appliances for fixation of maxillofacial fractures do not always suffice. Frequently, the traumatic injuries in adjacent regions preclude the oral surgical treatment of choice. The plaster head cap and ordinary extraoral craniomaxillary fixation appliances may be impractical from a neurological standpoint. They may interfere with subsequent trephining for head injuries, or with the treatment of associated spinal injuries that require skeletal traction. Extensive loss of cranial bones or severe comminution occasionally will render the use of suspension wires undesirable if not impossible. External pin fixation appliances of the Roger-Anderson type may prove unsuccessful or undesirable.

Not infrequently, therefore, fixation of facial fractures becomes a troublesome problem.

Such an instance is discussed herein. It was managed by the use of skull tongs, and a length of heavy wire from an ordinary coathanger. The appliance has since been modified (Fig. 1) and is adaptable to almost any maxillofacial fracture. Standard size bars have been secured to it, and universal Roger-Anderson joints applied to these bars to engage and secure other bars. These may be adjusted for traction or fixation in any direction or position.

The advantages of this appliance are as follows:

1. It is easy to utilize in an emergency procedure and can be applied in a few minutes.

2. It is easily adjusted, yet it is a permanent type of fixation and will remain in place for several weeks.

3. It permits adequate access for neurosurgical intervention as required in frontal, temporal, occipital, suboccipital and cervical regions.

4. It is suitable for use where there has been extensive loss of the frontal or temporal bones.

5. It may be used concurrently for skeletal traction in cervical vertebral injuries, with added comfort for the patient and convenience to those charged with his care. Sometimes, cervical fractures are not recognized until days after injury. The use of this appliance for both the skeletal traction and the maxillofacial fixation would simplify the management of both injuries.

The following precautions[1] should be observed:

1. The tongs should be checked daily and tightened as required.

2. A special drill point with a collar will prevent penetration of the inner table of the calvaria and simplify application.

3. If skeletal traction is contemplated, the tongs should be applied so that traction is in the plane of the articulating cervical facets.

REPORT OF A CASE—A 20 year old airman, second class, in the United States Air Force, was admitted to the hospital shortly after an accident in which he had sustained multiple injuries to the head, face and extremities. He had been taken immediately to the operating room where a tracheotomy, craniotomy and

The opinions or assertions contained in this article are the private ones of the writer and are not to be construed as official or reflecting the views of the Navy Department or the naval service at large.

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1. Crutchfield, W. G. Skeletal traction in treatment of injuries to the cervical spine. J.A.M.A. 155:29 May 1, 1954

enucleation of the left eye were done as emergency procedures.

The extensive fronto-orbital and maxillofacial injuries included the loss of two-thirds of the frontal bone, the anterior half of the roofs of both orbits, the medial halves of both orbital ridges, and the frontal sinuses. In addition, the left maxilla, zygoma, zygomatic arch, and nasal bones had been severely comminuted, with considerable separation and displacement of the fragments. The right zygoma was separated at the zygomaxillary suture and was unattached above the zygomaticofrontal suture. The arch, however, appeared to be intact. The right side of the maxilla was fractured transversely.

The patient had tolerated the emergency procedures well; nevertheless, reduction and fixation of the maxillofacial injuries were postponed until the patient's condition was well stabilized and laboratory studies could be completed. These included complete stereoscopic skull, maxillofacial, and chest roentgenographic studies, urinalysis, and hematologic, serologic and bacteriologic examinations.

Maxillofacial roentgenographic examination then revealed, in addition to the aforementioned injuries, an unfavorable fracture at the right angle of the mandible with an impacted third molar in the line of fracture. There was also a compensating fracture of the neck of the condyloid process on the left side of the mandible.

Laboratory studies were all within normal limits.

Tetanus prophylaxis and adequate antibiotic therapy were instituted immediately. On the fourth day after his injury, the patient was again taken to surgery. He was prepared and draped and intravenous thiopental sodium and endotracheal nitrous oxide and oxygen administered. An arch bar was secured to the mandibular teeth with 0.020 inch stainless steel wire. The right mandibular third molar was extracted, and a transosseous wire was passed

Fig. 1—Modified skull tongs showing bar, silver soldered to each tong, which engages a universal joint of the Roger-Anderson type. Ordinary acetylene welding rods ⅛ inch in diameter, which can be adapted by hand, are adjusted and secured by universal joint in desired position. Also shown are a bar applied for anterior traction and maxillary suspension wires

Fig. 2—Photograph taken two weeks postoperatively showing craniomaxillary fixation appliance. Fronto-orbital bone loss is apparent

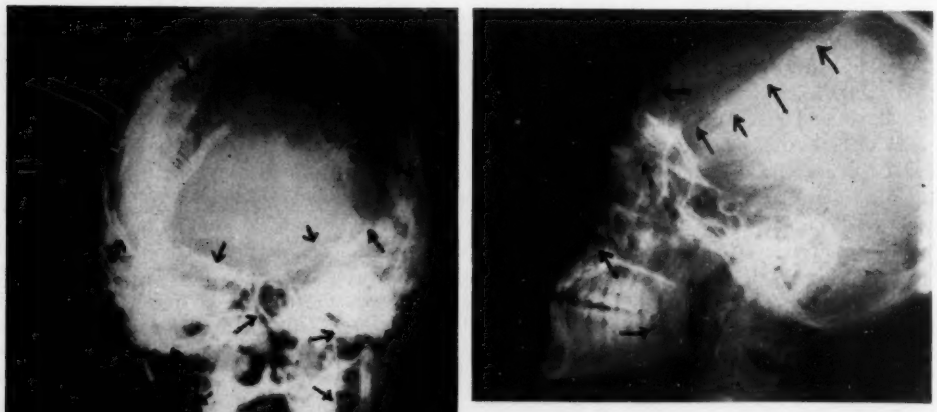

Fig. 3—Postoperative views showing bone loss and fracture sites. Left: Posteroanterior view. Above: Lateral skull view

through the buccal plate of each fragment into the socket. The ends were twisted, cut and bent over after manual reduction of the fracture. Continuous loop wires were placed on the posterior teeth of the maxilla. A suspension wire was passed around the right zygomatic arch as far anteriorly as possible. Another suspension wire of the same size (0.020 inch stainless steel) was passed through the soft tissues of the left cheek just inferior to the zygoma and into the oral vestibule opposite the maxillary first molar.

Skull tongs were then secured to the calvaria posterior to all traumatic defects. A heavy wire (coathanger) was adapted to the skull tongs and extended over the suspension wire on the left side. This was adjusted to maintain an even pull on the suspension wire without lateral tension (Fig. 2).

Intermaxillary rubber traction was applied, and the suspension wires secured to the mandibular arch bar opposite each first molar. This resulted in reduction and fixation of the fragments. The patient developed a severe exophthalmos on the right side which subsided within 24 hours. The treatment for this was moderate pressure over the eye. Cerebrospinal rhinorrhea continued for ten days before subsiding. Recovery was otherwise uneventful and the fixation was removed five weeks after injury (Fig. 3).

The patient was able to masticate a regular diet one week after the removal of the fixation appliance and was ready for definitive reconstructive surgery.

SUMMARY—Skull tongs have been used for craniomaxillary fixation. The principle of posterior cranial fixation was utilized.

There are several advantages in skull tongs when used by the neurosurgeon and the oral surgeon for maxillofacial skeletal traction.

A permanent modification of the conventional skull tongs has been developed which offers the advantages of simplicity and versatility.

Mixed tumor of the palate: *report of case*

■ *Noah R. Calhoun,* D.D.S.; Asa Yancey,† M.D.; Stanley Jackson,‡ D.D.S., and William Bridgeford,§ D.D.S., Tuskegee, Ala.*

Mixed tumors of the palate are relatively rare. Eggers[1] reported five cases in 1928. After a review of the literature, he found only 100 cases previously reported. Blum,[2] 1932, Abshier,[3] 1935, Rein and Feldman,[4] 1936 and Berger,[5] 1950, reported a total of 27 additional cases.

There are various theories on the origin of mixed tumors of the oral cavity. Eggers' analysis of 92 cases of mixed tumors of the palate and a comparison of them with similar data pertaining to the parotid and submaxillary glands gave greater support to the theory of displaced embryonic cells as the origin of these tumors. From a microscopic examination alone, a large number of these tumors show malignant characteristics, but from a clinical point of view, almost none. Mixed tumors seldom perforate the hard palate, and, when these tumors are adequately removed, recurrences are rare.

The following case is reported because it is an instance of a recurrent mixed tumor which perforated the hard palate.

HISTORY—On March 28, 1955, a negro man aged 34 years was admitted to the Veterans Administration Hospital, Tuskegee, Ala., with a diagnosis of neoplasm of the palate. At the time of admission the patient's chief complaint was a large mass involving the palate. The mass interfered with mastication. The patient stated that a similar mass had been removed from his palate in 1937, but had recurred in 1945. The recurrent mass had grown slowly until approximately one year prior to the present admission when the rapidity of growth had increased.

CLINICAL EXAMINATION—Examination of the oral cavity revealed a mass involving the hard and soft palates (Fig. 1). The mass was approximately 5 cm. in diameter, lobulated and primarily attached to the left side of the hard palate. The overlying mucosa was light pink with a brownish pigmentation of the anterior superior portion. Palpation revealed the mass to be soft and rubbery.

The hemogram and urinalysis were essentially normal.

ROENTGENOGRAPHIC EXAMINATION — A modified Waters' view (Fig. 2) was taken. The examination showed an ill-defined area of decreased density in the hard palate. This area was thought to represent bone destruction. The margins were not well defined. There was cloudiness of the left maxillary sinus.

A posteroanterior view of the chest showed the bony cage, heart and great vessels to be normal. The bronchovascular markings were increased in the perihilar regions. There was no roentgenographic evidence of pulmonary metastasis.

DIAGNOSIS—A tentative diagnosis was made of mixed tumor of palate, hemangioma of palate.

A specimen was taken for biopsy. Anesthesia was obtained by infiltration of the oral branch of the nasopalatine nerves and right and left anterior branches of the palatine nerves with 2 per cent lidocaine hydrochloride and epinephrine solution. A wedge-shaped section

*Chief, dental service, Veterans Administration Hospital.
†Chief, surgical service, Veterans Administration Hospital.
‡Staff dentist, Veterans Administration Hospital.
§Dental intern, Veterans Administration Hospital.

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2. Blum, T. Mixed tumors of the palate. D. Cosmos 74:943 Oct. 1932.
3. Abshier, A. B. Mixed tumors of palate. Arch. Dermat. & Syph. 32:622 Oct. 1935.
4. Rein, C. R., and Feldman, M. H. Mixed tumors of the palate: report of case. J.A.D.A. 23:1310 July 1936.
5. Berger, A. Mixed tumors of the palate. J. Oral Surg. 8:208 July 1950.

Fig. 1—Neoplasm of palate

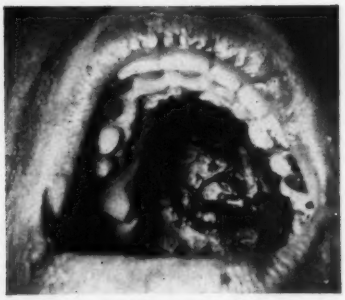

Fig. 3—View of palate taken 14 days postoperatively

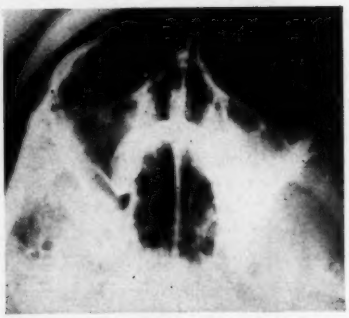

Fig. 2—Modified Waters' view. Note cloudiness of left maxillary sinus

of tissue, including normal mucosa, was removed from the superior border of the tumor. The biopsy report was mixed tumor.

PREOPERATIVE TREATMENT—An impression of the palate was taken, and an acrylic splint was constructed to cover the intended site of operation.

OPERATION — Under endotracheal anesthesia using thiopental sodium, nitrous oxide and oxygen, the tumor was excised.

A horizontal incision was made in the left mucobuccal fold opposite the canine fossa. The overlying mucosa and periosteum were reflected, and the left maxillary sinus was entered and explored. There was no clinical manifestation of a pathologic condition in the sinus. An incision was then made in the palate approximately 1 cm. anterior to the tumor and extending down to bone. A margin of the mass was dissected from the bone, and a perforation of the hard palate was noted. The tumor was then removed en bloc with a safe margin of bone around the perforation.

The remaining bone defect was packed lightly with a strip of iodoform gauze which was saturated with balsam of Peru. The dressing was held in place with the previously prepared acrylic splint.

POSTOPERATIVE TREATMENT—Five days postoperatively, the gauze strip was removed in sections over an eight day period. The acrylic splint was further utilized to cover the remaining defect of the palate (Fig. 3). The patient

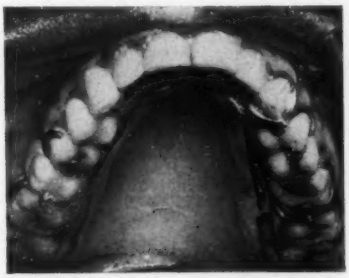

Fig. 4—Acrylic obturator in place

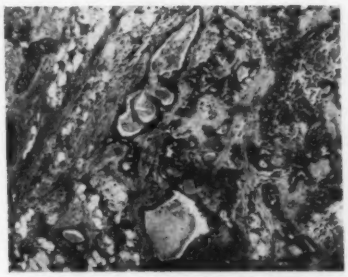

Fig. 5—Microscopic view of neoplasm

was discharged and scheduled for recall in three months for follow-up examination and construction of an obturator.

On readmission the chest roentgenogram and hemogram were essentially negative. Oral examination revealed two sphenoidal masses approximately 1 cm. each in diameter extending from the anterior margin of the palatal defect. The margins were covered by epithelium. The masses were removed and diagnosed by microscopic study as nasal polyps. An acrylic obturator with clasps and rests was constructed and inserted (Fig. 4).

PATHOLOGIC FINDINGS—The specimen was plano-convex in shape and measured 5 by 4.5 by 3 cm. The convex surface was knobby and covered by dirty gray mucous membrane which was thickened and tended to strip away from the underlying tissue. Occasional small spicules of bone were attached to the mass. Several pieces of bone and a piece of antral membrane were also submitted for microscopic study.

Sections of the specimen revealed a tumor of salivary duct epithelium which exhibited great structural variation (Fig. 5). The proliferating epithelial cells lined ducts and alveolar spaces, formed cords and solid aggregations with occasional cystic structures, some of which contained acidophilic secretions. The epithelial cells were small and fairly uniform with ovoid nuclei in a small quantity of acidophilic cytoplasm. No mitotic figures were seen. The tumor was not encapsulated, and extended into the submucosal connective tissue which appeared compressed and hyalinized. The epithelium showed moderate hyperkeratosis.

The final diagnosis was pleomorphic adenoma (mixed tumor) of palatal salivary glands.

■ DIAGNOSIS

Diagnosis holds the first rank in all sciences and it is the most difficult part; without an exact and precise diagnosis, theory is always faulty and practice often incorrect.—*Guillaume Dupuytren (1777-1835).*

Tongue grafted to dental pulp as a complication of jaw fracture: *report of case*

■ *W. R. Roberts, T.D., M.D.S., M.B., Ch.B., Worcester, England*

A nine year old American girl on holiday in Worcestershire, England, had a bicycle accident at 7 P.M. on June 21, 1955. She was taken to the Worcester Royal Infirmary and was seen at 10 P.M. by the dental house officer, who found her injuries to consist of lacerations of the chin, lower lip and oral mucosa with a comminuted fracture of the anterior part of the mandible. The general condition of the child was excellent. Roentgenograms were taken, penicillin therapy started and arrangements made to operate on the patient the following day.

OPERATION—Under endotracheal general anesthesia, the lacerations of the oral mucosa were sutured. The mandibular fragments were reduced and maintained in position by interdental wiring. The deciduous molars were used for the eyelets, despite the fact that these teeth were in very poor condition, mainly because of advanced caries but partly because of large restorations having crumbled in the accident. None of the freshly erupted permanent teeth were used for fixation. Excellent position of the bone was obtained as the fragment ends could be visualized through the chin wound.

The wound was closed in layers with drainage. The child left the operating room with intermaxillary fixation and tongue suture in position, with instructions for the latter to be removed only when the child was fully conscious.

The immediate postoperative period was uneventful. The child did not at any time complain of discomfort and was cooperative in every possible way.

On July 8, 16 days after immobilization, the wounds had healed. Because of the extreme youth of the patient and early immobilization of the reduced fragments, it was considered justifiable to allow intermaxillary movement, so the tie wires were removed. The child started to whimper, and on being asked what was the matter, she replied, "My tongue is stuck to my tooth." On examination it was found that the tongue had been grafted to the exposed pulp of the maxillary left second deciduous molar (Fig. 1). Presumably the pain experienced by the child was due to traction on the pulp each time the child moved her tongue.

It was proposed to take the child into the operating room again, sever the tongue attachment and remove the broken teeth with all eyelet wires. This procedure had to be delayed until July 23, since she had been exposed to a patient with scarlet fever. The delay, however, did not unduly inconvenience the child, as she had learned to control her tongue movements to avoid pain and had to be on a semiliquid diet because of her healing jaw fracture. The maxillary left second deciduous molar was extracted and the tongue severed from it (Fig. 2). The other fractured deciduous teeth were also removed.

By August 1, all sites had healed and jaw function was quite normal. The child returned to America not very much the worse for her unfortunate accident in England.

Consultant dental surgeon, Worcester Royal Infirmary.

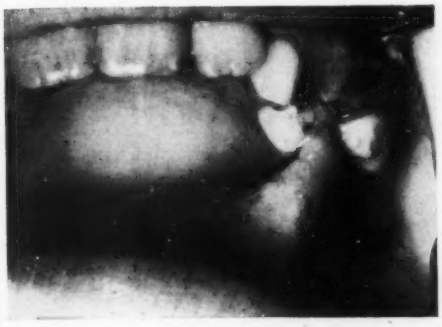

Fig. 1—Tongue attached by pedicle to exposed pulp of maxillary left second deciduous molar

Fig. 2—Low power photomicrograph showing tongue and pulp tissue joined together. 1, Muscle fibers of tongue tissue. 2, Tissue of doubtful origin connecting pulp to tongue; a few muscle fibers are discernible. 3, Epithelial encroachment around pulp, derived presumably by direct extension from the mucous membrane of tongue. 4, Comparatively normal pulp tissue

COMMENTS—This case is not reported with the object of suggesting that grafting to the pulp can serve any useful purpose.

It is interesting to consider how the phenomenon occurred. There are two possibilities:

1. A lacerated tongue lying close to an exposed pulp possibly could graft itself, but it was not recorded at operation that the tongue was damaged. Furthermore, it is hardly conceivable that the tongue of a growing girl could remain so immobilized unless trapped.

2. The more likely possibility is that the tongue was caught between the teeth during intermaxillary fixation and that the sharp edges of the broken teeth provided the raw tongue surface onto which the exposed pulp could become grafted. This also would explain the immobility of the tongue, although it was odd that the child for 16 days did not draw attention to the fact that her tongue was trapped in this way.

At any rate, it can be concluded that viable tissue can be grafted successfully to an exposed, vital dental pulp.

Stainless steel bone onlay splints for immobilization of displaced condylar fractures—a new technic:

report of three cases, one of ten years' duration

■ *Arthur E. Smith,* M.D., D.D.S., Sc.D., and Marsh Robinson,† M.D., D.D.S., Los Angeles*

The purpose of this paper is to present a new method for immobilization of displaced subcondylar fractures after an open reduction has been performed. There is controversy as to the type of fractures that should be treated by open reduction; however, that controversy will not be discussed in this paper. In our opinion the usual fracture of the condyle with no or minimal displacement needs no treatment other than intermaxillary fixation.

There are two types of subcondylar fractures which require open reduction and adequate immobilization if future function of the oral organ is to be normal. These types are: (1) a subcondylar fracture with the proximal fragment displaced out of the mandibular fossa, (2) a subcondylar fracture in which there is overriding of the distal fragment. In this second type, reduction by intermaxillary traction will cause a downward and forward movement of the condyle. After healing, the vertical condylar-angle distance is shortened which results in a gross malocclusion of the teeth. Usually, in this second type of fracture, the factors requiring open reduction are not known until after more conservative treatment has been attempted and has failed. The case histories included herein will illustrate the problem.

METHODS AND MATERIALS—The use of metal to immobilize fractured bones dates back to before the turn of the century. Recently, the method of an individually designed bone onlay splint for the immobilization of angular fractures was presented.[1] From a special formula of stainless steel plate, 0.027 inch thick, an adequate bone onlay splint can be designed and constructed for use in immobilizing these subcondylar fractures. A special drill, stainless steel hexagon convex-head screws, wrench and other materials have been reported previously.

CASE 1—An 18 year old, white boy was brought to the office April 26, 1954, with multiple jaw injuries that had been incurred in an automobile accident nine days previously. Physical (Fig. 1, above) and roentgenographic examination (Fig. 1, below) revealed four fractures of the mandible: (1) right subcondylar fracture with anterior medial displacement; (2) compound fracture of the right body between the first and second molars with displacement; (3) left subcondylar fracture with anterior medial displacement; (4) compound fracture anterior to the left mental foramen. On April 30, 1954, in St. Vincent's Hospital, an open reduction of the right mandibular angle fracture was done and immobilized by means of an individually designed stainless steel bone onlay

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*Professor of reconstructive plastic, maxillofacial and oral surgery, University of Southern California, School of Dentistry.

†Professor of oral surgery, University of Southern California, School of Dentistry.

1. Smith, A. E., and Robinson, M. Individually constructed stainless steel bone onlay splint for immobilization of proximal fragment in fractures of angle of mandible. J. Oral Surg. 12:170 April 1954.

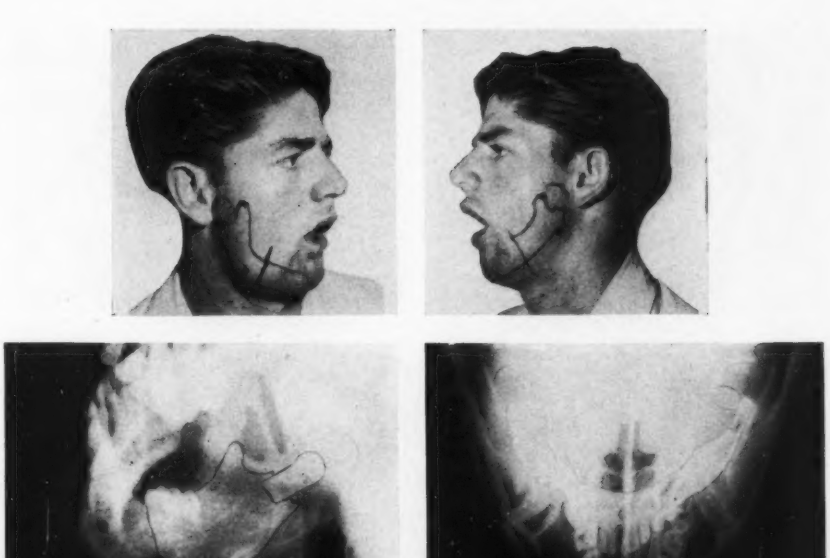

Fig. 1—Case 1. Above left: View taken April 26, 1954, showing fractured misplaced right condyle and fracture of right body of mandible. Above right: Fractures on left side. Below left: Roentgenogram taken April 26 showing right mandibular displaced fractures. Below right: View showing fractures and displaced condyles

splint. On May 7, in the hospital operating room, an open reduction of the right displaced subcondylar fracture was carried out and a new technic for immobilization utilized. The patient's hair was shaved 3 cm. above and anterior to the ear. After the patient was prepared for surgery, an incision of approximately 2.5 cm. was made below the angle of the mandible. The skin, subcutaneous tissue, and platysma muscle were divided down to and through the periosteum over the angle. A small hole was drilled and a stainless steel wire temporarily placed so that the downward traction could be made on the ramus to facilitate the reduction and immobilization of the subcondylar fracture (Fig. 2, above left). An incision was made through the skin only, 1 cm. above the shaved hairline and 5 cm. anterior to the ear.

The incision was extended backward and downward directly to the most anterior portion of the helix, and then down along the anterior inner margin of the ear. The incision was ended 0.5 cm. behind the lobule. The outlined skin flap was elevated by sharp dissection to expose the region lateral to the fracture. This flap was brought forward and immobilized to the cheek with three sutures. Bleeding was controlled by electric coagulation.

The point lateral to the mandibular notch was determined by deep palpation. The tissues directly lateral to the mandibular notch were divided bluntly down to and through the periosteum covering the sub-sigmoid notch region of the ascending ramus. Extreme caution was taken to prevent injury to any branch of the facial nerve during separation and retraction of the tissues. (Cutting is never done.) An opening of 2 cm. was made. With small blunt re-

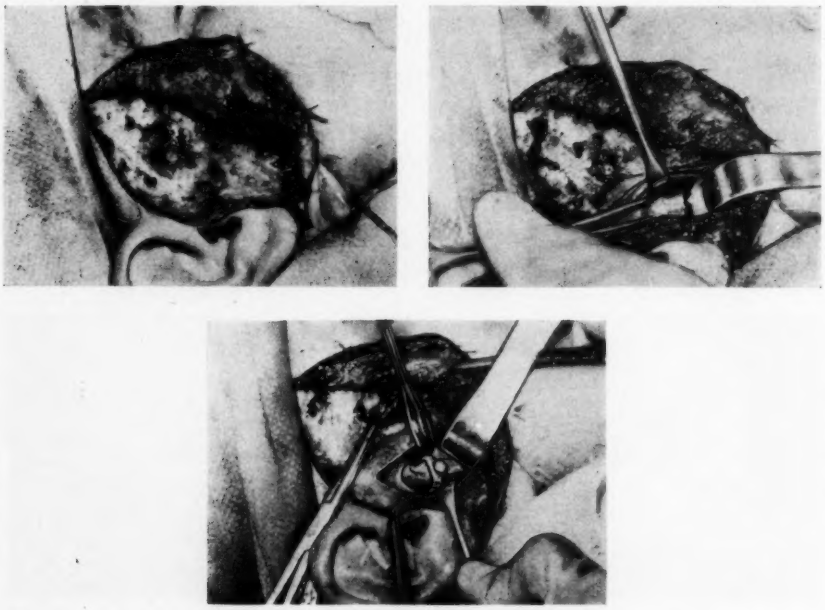

Fig. 2—Case 1. Above left: Patient at surgery, May 7, showing reflection of sharply dissected skin flap. Flap is rolled over and immobilized to cheek with sutures. Note traction wire at angle of mandible. Above right: Reduction of fractured displaced condyle. Exposure was accomplished by blunt separation of tissues to protect small branches of facial nerve. Below: Immobilization of fracture with stainless steel bone onlay splint. Upper screw is shown, lower screw is concealed by tissues

tractors this opening was moved directly over the desired region.

The fractured condyle was located approximately 1 cm. anterior and medial to the mandibular fossa. The condylar fragment was carefully mobilized, and extreme caution taken not to strip the soft tissue from this fragment. The fractured fragments were manually reduced (Fig. 2, above right). Across the fracture site the special stainless steel bone onlay splint was placed. The pilot holes were drilled in both fragments under a constant stream of normal saline solution. The bone onlay splint was then fixed by placing the two special screws (Fig. 2, below).

The deep tissues were closed by several no. 00 chromic mattress-type sutures. The skin flap was returned to its original position and immobilized with interrupted silk sutures. A small Penrose drain was placed under the flap, ending below the lobule. The drain was removed in 24 hours, the skin sutures in four days, and the intermaxillary wires in seven weeks. On May 17 the same procedure was used to reduce and immobilize the left subcondylar fracture. The patient made an uneventful recovery (Fig. 3).

COMMENT—This case history demonstrates that these special stainless steel bone onlay splints can be constructed prior to surgery in such a fashion that the splints will adequately resist the muscle tension that tends to displace the fractures for sufficient time to permit adequate healing in a normal anatomic position.

CASE 2—On Feb. 22, 1944, a 26 year old, white housewife was referred because of mul-

tiple jaw injuries that she had received in an automobile accident nine days previously. Examination revealed a compound oblique fracture of the body of the right side of the mandible, a transverse fracture of the maxilla with posterior displacement, lacerations of the lower lip and chin, fractures of the maxillary anterior teeth and a fractured, dislocated left condyle (Fig. 4, left). On Feb. 25, in the California Hospital, the fractures of the maxilla and the body of the mandible were reduced (Fig. 4, above) and immobilized by means of intermaxillary wiring in conjunction with a plaster head cap. At the same time, the fracture of the neck of the con-

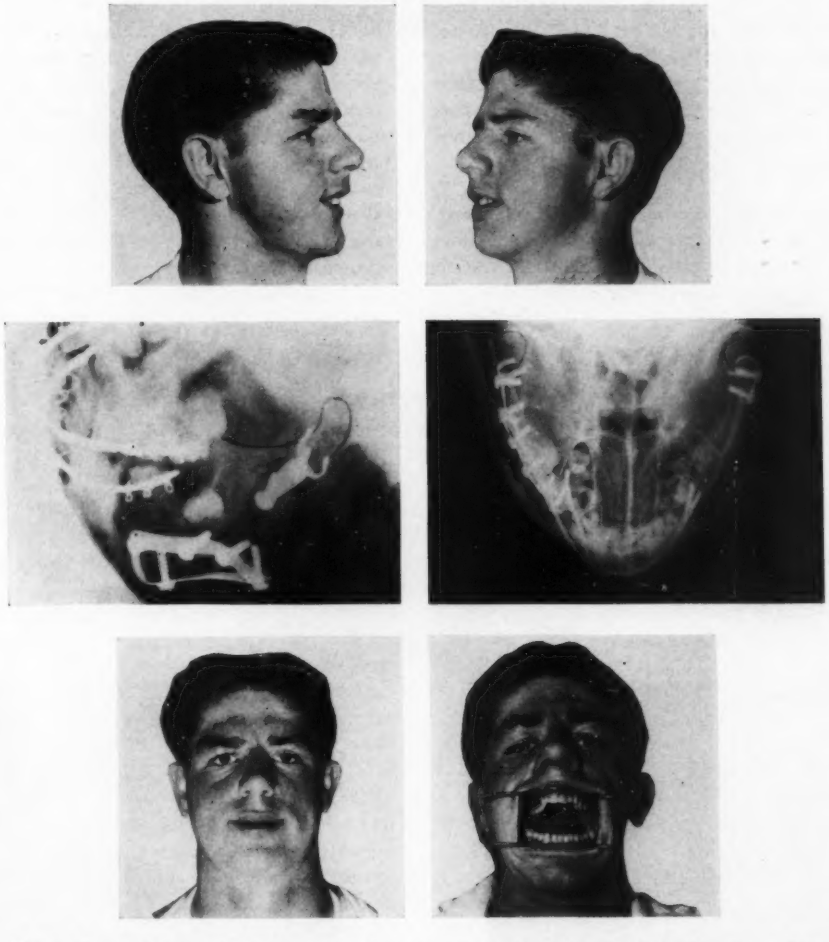

Fig. 3—Case 1. Above left: Postoperative view taken Sept. 27. Note normal profile. Above right: Left profile. Center left: Postoperative roentgenogram showing subcondylar fracture reduced and immobilized. Center right: Postoperative view showing immobilization of fractures with three stainless steel bone onlay splints and intraoral arch bars. Below left: View showing balanced face. Below right: Mandibular opening in midline

dyloid process on the left side was reduced by an open operation and immobilized by this new technic (Fig. 4, right). The patient made an uneventful recovery and soon left the Los Angeles area.

In May 1954, the patient was contacted by letter in Wilmington, Del. She was examined by her dentist and a local radiologist and roentgenograms, photographs and motion pictures were taken (Fig. 5). During the past ten and one half years, the patient has had the eight maxillary anterior fractured teeth replaced. She has experienced no pain about or in the temporomandibular joints. Her teeth occlude normally as before the accident. Her jaw opens widely and in the midline.

COMMENT—It is only through long term follow-up that a true evaluation of any new surgical technic can be made. This case history describes the follow-up over a ten and a half year period of this new type of immobilization of fractured displaced condyles after open reduction. Previously it has been our experience that interosseous wiring is not sufficient to immobilize adequately the proximal fragment against the pull of the external pterygoid muscle.

CASE 3—A 37 year old white housewife was referred April 15, 1954, because of a fractured jaw which she had sustained in an auto accident 11 days previously. Physical and roentgenographic examination revealed that the mandible was in five fragments. On the right, the condyle was fractured but not displaced (Fig. 6, above left). An open fracture was in the right mental region. The fractures of the left ramus were displaced (Fig. 6, above right). One fracture extended from the midportion of the sub-sigmoid notch to the angle (Fig. 6, center).

A horizontal fracture extended through the anterior half of the left ramus. The patient had

Fig. 4—Case 2. Left: View taken Feb. 22, 1944, showing fractured displaced left subcondylar fracture. Above: Patient at surgery. Note preoperative facial paralysis. Right: Left condylar fracture after reduction; view taken March 30

Fig. 5—Case 2. Above: Roentgenogram taken Aug. 26, 1954, ten and a half years postoperatively. Below left: Ten years' postoperative view. Note normal occlusion and intermaxillary relation. Below right: Note normal action of fifth and seventh nerves

a full complement of teeth with a left open-bite retruded type of malocclusion. Her upper eyelid was paralyzed (Fig. 6, below).

On April 23, in St. Vincent's Hospital, an open reduction and immobilization of the multiple fractures of the left ascending mandibular ramus were done.

A 7 cm. incision was made approximately 1 cm. below the left side of the mandible. The skin, subcutaneous tissue and platysma muscle were divided down to and through the periosteum along the lower border of the ramus. The periosteum, masseter muscle and all superficial structures were elevated from the lateral surface of the ramus. The fractures were adequately visualized, then reduced. An individually designed "N" shaped special stainless steel bone onlay splint was placed by means of four screws. The deep tissues were closed in layers with no. 000 chromic gut sutures. The skin was approximated with a no. 30 stainless steel subcuticular pull-out wire. The patient made an uneventful recovery (Fig. 7, 8).

COMMENT—This case history demonstrates that the Risdon approach is adequate for reduction and immobilization of those subcondylar fractures in which the condyle remains in the mandibular fossa. Also, it illustrates the necessity of individually designing the stainless steel bone onlay splint for each particular case.

CONCLUSIONS—This improved method of individually designing and constructing a stain-

Fig. 6—Case 3. Above left: Fractures of right side of mandible outlined; April 15, 1954. Above right: Left profile. Center left: Lateral roentgenogram taken preoperatively showing displaced fractures of left ramus. Center right: Posteroanterior view showing bilateral fractures. Below: Showing preoperative malocclusion due to displacement of left subcondylar fractures. Note paralysis of upper eyelid

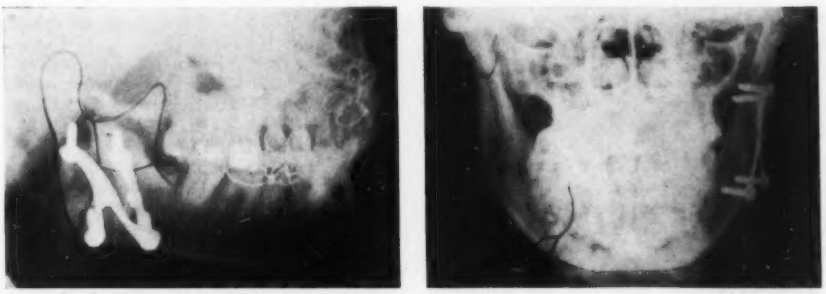

Fig. 7—Case 3. Left: Postoperative left lateral roentgenogram taken June 3, showing adequate immobilization of left subcondylar fractures by means of individually constructed stainless steel bone onlay splint. Right: Posteroanterior view

Fig. 8—Case 3. Left: Picture taken Sept. 25, showing normal profile. Right: Showing normal opening in midline achieved through accurate reduction and adequate immobilization of fractures

less steel splint insures adequate immobilization of the fragments in subcondylar fractures and allows them to heal in normal relation. The metal used in this splint is relatively nonelectrolytic, nonmagnetic, noncorrosive, nontoxic and causes negligible tissue reaction. By an open type of operation it is possible to effect an anatomic reduction of the fracture. Many of the dangers involved in former procedures are greatly reduced or entirely eliminated. These dangers include nonunion, healing in malposition, the interposing of soft tissues at the fracture site, a stormy postoperative course, injury to the facial nerve, malocclusion with lateral deviation, future prosthetic problems and temporomandibular joint pain. The scar is negligible and unnoticeable. The time required for this procedure is no longer than that required by other surgical methods. The patient is comfortable, since a plaster head cap, protruding extraoral pin fixation or intraoral appliances are eliminated.—*511 Wilshire Medical Building.*

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EDITORIALS

The oral surgeon's investment program

THERE IS A GREAT NEED for a better understanding of finances and investments by all oral surgeons, especially those in their early years in practice. The sudden experience of financial success in private practice after long years of preparation frequently brings along with it the feeling that this newly found earning power will never decrease. The pent-up family desires for new clothes, new automobiles, a new home and social club memberships, combined with taxes and insurance demands, usually result in so much deficit financing that little attention can be given to the orderly investment of funds which are capable of yielding important future returns.

The habit of regular saving over and above investment in a home and insurance is one that should be developed as early as possible. The use of earned money for luxurious automobiles, expensive wardrobes and a home beyond the needs of family requirements yields only intangible results and also denies the owner of possible investment of these added funds in securities that will produce material profit. The amount of money invested in bonds, savings accounts and investment trusts may not be impressive in early years, but at least it is instrumental in developing the investment habit and also provides returns that will make larger investments possible in the future.

It is the opinion of most investment counselors that investing should not only be started early in life, but should also be as diversified as is practicable. This usually means an adequate life insurance program that will provide the maximum amount of protection for the least amount of money expended, some good substantial and well chosen common stocks and some government bonds. Since it is difficult for the small investor to obtain adequate diversification with small amounts of money, investment trusts with cumulative investment plans providing for small monthly deposits offer an excellent opportunity for the young investor. Their advantage lies primarily in that the investor may not only deposit small monthly amounts, but also obtains excellent diversification since investment trusts as a matter of practice usually own well proved common stocks in greater diversification than can be achieved by any average investor.

Investment clubs, where a small group joins together and organizes for the purpose of monthly investment in diversified securities, also provide an excellent opportunity for education of the young investor since such clubs are based on careful study of many companies by all members of the organization. In effect, such a club becomes a small investment trust, but carries with it little administrative expense. Monthly deposits in such an enterprise are usually modest, but may be increased as conditions warrant.

In either event, monthly investments carried out with regularity over a period of several years eventually produce a substantial cash dividend return plus an anticipated capital gain which together can be very instrumental in forming the foundation for the creation of a substantial and comfortable estate. Such funds of course can be utilized for retirement purposes or for protection against severe and protracted family illness.

The temptation to delay the initiation of such a program is considerable since family pressures are always great. However, the wise professional man will start early and invest monthly in gradually increasing amounts, accepting the payments as a regular obligation. In this way he can safely plan on eventually achieving true financial security.—*Fred A. Henny.*

■ INFEKTION UND ANTISEPTIK IN DER STOMATOLOGIE (INFECTION AND ANTISEPSIS IN STOMATOLOGY). By E. Mischol. 168 pages with 48 illustrations. Index. 26.80 Swiss Francs. Berne, Hans Huber, 1955.

This book contains a great quantity of valuable information on asepsis, antisepsis, methods of sterilization and disinfection, parasitism, preservative therapy, root canal treatment, oral surgery and focal and periapical infections. It contains a complete index, a comprehensive bibliography and a data chart on disinfection and sterilization.

The book is well bound and printed on high grade paper in readable type, and it is excellently illustrated with roentgenograms, drawings and photographs. It is regrettable that this work is not available in English, for it would be read and reread with interest by many of our professional men were it not for the language barrier.—*Paul H. Glucksman.*

■ DEUXIÈME CONGRÈS INTERNATIONAL D'ODONTO-STOMATOLOGIE (SECOND INTERNATIONAL CONGRESS ON ODONTOSTOMATOLOGY). Fédération des Syndicats Dentaires d'Algérie. 265 pages with illustrations. Price not listed. Paris, Julien Prélat, 1954.

This paper-bound book, published in French, contains the proceedings of the Second International Congress on Odontostomatology, held in Oran, Algeria, in April 1954. The 50 papers cover a wide range of subjects, including the influence of nutrition on caries, anesthesia, endodontics, unilateral condyloid hypertrophy, immobilization in treatment of periodontal diseases, fluoridation, public dental service in Norway, oral cancer and focal infections.

Among the authors and their subjects are: Dr. Benediktsson, Copenhagen, "Position of the Teeth and the S;" Prof. Flohr, Saarbrücken, "Implantation of Plastics;" Prof. Hoffer, Milan, "Teleroentgenography in Gnatho-Orthopedics;" Dr. Joachim, Brussels, "Prosthetic Treatment of the Lower Jaw"; Dr. Maurel, Paris, "Inclusions and Implants of Resins in Maxillofacial Surgery," and Prof. Péri, Paris, "Periodontal Lesions of Osteitis Deformans with Dental Fluorosis."

The book summarizes adequately the recent advances in European research and treatment. —*Paul H. Glucksman.*

■ CEREBRAL PALSY—ADVANCES IN UNDERSTANDING AND CARE. By Viola E. Cardwell, R.N., P.T., M.A. 625 pages with 81 illustrations. Index. Appendix. $5. New York City, Association for the Aid of Crippled Children.

Written with the aim of being a source of benefit for both the best informed and the least well informed persons interested in the subject of cerebral palsy, this book in its excellent presentation of data fulfills that dual purpose. Part of the book is so technical that it will be understood only by specialists in medicine, neurology, anatomy and physiology. Part of it deals with social aspects of the subject at a level of value to the trained social worker or psychologist and part deals with parental problems, the suggestions regarding which are easily understood by interested lay persons.

Since the book combines all these approaches, it obviously is not intended for hurried, one-time reading. Rather, it should serve as a splendid reference for the professionally trained and the laity. Its three divisions, its well ordered 26 chapters, its comprehensive index as well as its easily readable print and numerous illustrations all combine to facilitate its use.

Particularly notable is the book's coverage of developments in cerebral palsy during the last five to ten years. Among such developments is that of dental care for those handi-

capped with one or another type of the cerebral palsies. Naturally, inasmuch as dental needs of the cerebral palsied largely parallel those of the nonhandicapped, the discussion centers on preventive measures and the methodology of rendering care. The space devoted to dental health care and the references cited on the subject denote the rapidly developing interest in this part of the cerebral palsy problem and points up the necessity for even more widespread interest on the part of the dental profession.—*Richard C. Leonard.*

■ COLOR ATLAS OF ORAL PATHOLOGY. U. S. Naval Dental School of the National Naval Medical Center. 188 pages with 461 figures in color. Index. $12. Philadelphia, J. B. Lippincott Co., 1956.

The preparation of material for histologic examination and study is in its most essential respect a color process. On this account, histologic illustration lends itself ideally to color. The color reproduction is one of the outstanding advantages of this publication. Another is the fact that the original color transparencies were chosen principally from the best in three outstanding collections in this field rather than from just one. A third is that the text supplied to describe the pictures, prepared originally for the officer training programs of the Naval Dental Corps, is clear and highly suited for teaching purposes. It is also well adapted for the use of practitioners and others interested in oral disease. Finally, the publisher has cooperated splendidly to produce a volume of high quality.

The pathologic material is preceded by a useful chapter on normal histology and development, 16 pages in length with 65 figures and charts of the same high quality as that of the body of the book. There is a useful table of contents, a more than adequate index and a well-selected bibliography of over 20 pages.

In addition to the introduction, there are four chapters: developmental disturbances, diseases of the teeth and supporting structures, diseases of the oral mucosa and neoplasms. This book is a worthy companion piece to the *Color Atlas of Pathology* recently published by Lippincott and another splendid contribution to the field of visual education. It deserves unlimited support from students, teachers and practitioners, both in dentistry and medicine.—*Edward H. Hatton.*

■ CLINICAL OPERATIVE DENTISTRY. By William John Simon, D.D.S. 381 pages with 650 illustrations on 538 figures. Index. $9.50. Philadelphia, W. B. Saunders Co., 1956.

Forty-five persons have contributed to this book. The text is composed of six chapters: guides to operative dentistry, amalgam restorations, inlay restorations, silicate cements, acrylic resin fillings and gold foil restorations. A liberal biographic reference is appended to each chapter except the first. A discussion of ceramic restorations has been omitted because these restorations most frequently are porcelain jacket crowns and are dealt with in textbooks on crown and bridge.

Dr. Simon's style of writing is clear, a skill of special value in describing technical processes in operative procedures. The author approaches his subject directly and does not waste words in his descriptions. It is a pleasure to recommend a book that shows such a broad grasp of the subject and which presents the theories of so many previous writers.

The author is to be commended on the painstaking care with which he has prepared his material. He has produced a most creditable volume. The book is particularly well illustrated, and the mechanical makeup worthy of praise. Both author and publisher are to be congratulated on the result. The reviewer feels that this book will serve the student and practitioner who desire to review operative procedures.—*E. Alan Lieban.*

■ THE TREATMENT OF MIXED PAROTID TUMORS. F. G. Smiddy. Brit.M.J. No. 4962: 322 Feb. 11, 1956.

Mixed tumors of the parotid gland are the most common type of tumor found within the gland and constitute approximately 90 per cent of the tumors in this region. These are believed by many to be malignant although the degree of malignancy may be low. There has been some controversy as to the pathologic origin of these tumors. It is believed that, regardless of the type of tissue from which the tumors might be derived, no relationship can be established between their histologic nature and the clinical course, and regardless of the type of therapy which has been advocated and carried out, the recurrence rate still remains high.

A survey was made of 80 patients referred to the radiotherapy department at Leeds from 1935 to 1949. There were no patients under 15 years of age, and there were approximately the same number of patients in each ten year age group. Most of the patients applied for treatment within three years after they first noticed a parotid swelling. Most tumors were treated by surgery plus deep roentgen therapy.

The over-all recurrence rate was 30 per cent. In the majority of instances, recurrence occurred soon after treatment; nearly all within five years. In these patients, simple surgical procedures were found to be inadequate, and the mortality rate was high. In 24 recurrences, seven deaths occurred, and in the two post-mortem examinations performed in this group, one revealed metastatic lesions in the cervical spine and the other in the brain. An evaluation of the recurrences shows that the predominant cause was incomplete excision, and even when more radical surgery was employed, the results suggest that irradiation in some form should be used as an adjunctive therapy.

The author discusses the technical problems encountered in surgery of the parotid region. The method of identification of the facial nerve at its source is presented. Tumor dissection after identification of the larger branches of the facial nerve is advocated as more satisfactory than the method which traces back through the tumor for smaller peripheral tributaries. In identification of the nerve, the digastric groove is freed of the attachment and overlying tissues, and a probe placed along the groove to the point of emergence of the facial nerve from the stylomastoid foramen.—*Irwin A. Small.*

■ SIALOGRAPHY. Joseph Winsten, David M. Gould and Grant E. Ward. Surg., Gynec. & Obst. 102:315 March 1956.

Sialography is the delineation of the salivary duct system by the injection of a radiopaque medium. Although limited in scope, the method has definite value in patients with obscure swelling or pain in the region of the salivary glands. A contrast medium such as iodized oil is used.

Lesions for which sialography may be useful may be divided into three types: (1) space-taking lesions extrinsic to the parotid gland and exerting pressure through the gland capsule, (2) space-taking lesions intrinsic to the parotid gland and exerting pressure on the duct system and (3) abnormalities within the duct system itself.

Extrinsic lesions are: metastatic lymph nodes adjacent to the gland, cysts or tumors in the pterygoid fossa, hemorrhage in adjacent muscles, tumors of the mandible and lipomas in the buccal or cervical fat. In these instances, the entire gland or a large portion of it appears to be displaced. The lesion itself usually blends with the soft tissues, and unless it is composed of bone or fat or contains calcium deposits, it cannot be differentiated from the surrounding bed.

Intrinsic lesions may be composed of mixed tumors, retention cysts, branchial cleft cysts, Warthin's tumor, abscesses and all other benign

and malignant tumors primary in the parotid gland. In these instances, the ducts are displaced at some focal point within the gland. The cell ducts appear to sweep around the mass and embrace it. Sometimes the ducts appear to be attenuated and stretched taut.

Abnormalities of the duct system are usually due to inflammatory processes. The mechanism that initiates the process may be infection both retrograde and blood-borne, calculi, mumps and ductile strictures. Dilatation and strictures of Stenson's duct are readily apparent by sialography. Sialectasis, which apparently is a result of any inflammation of the gland, also produces a distinct roentgenographic pattern of puddling of the opaque medium in the dilated terminal branches of the ducts.

Although sialography can be of inestimable value in the diagnosis of diseases of the salivary glands, it should not be abused as a short-cut method of diagnosis. Even with a meticulous history, physical examination and laboratory tests, the pitfalls in diagnosis are great.—*Irwin A. Small.*

■ THE MANAGEMENT OF LINGUAL CANCER. Frank E. Berridge, M.D., and Arthur D. James, M.D. Surg., Gynec. & Obst. 103:595 Nov. 1956.

The tongue is the site most frequently involved in cancer arising in the oral cavity. Malignant tumors of the tongue cause more deaths each year than any other head and neck cancer, including thyroid neoplasms. In the head and neck region, the incidence of lingual cancer is second only to cancer of the lip (excluding skin cancer).

This study involves 102 instances of carcinoma of the tongue. Seventy-four of these occurred in men. The patients' average age was 62.4 years. The site of the lingual cancer was posterior to the circumvallate papillae in 47 patients; in the remaining 55, the lesions occurred anteriorly. The anterior tongue cancers were almost exclusively squamous cell carcinomas and were located mainly at the lateral margin. Approximately one fourth of these patients had palpable cervical nodes on admission to the hospital. Cancer of the posterior third of the tongue appeared more frequently in the men, and the predominance of squamous cell carcinoma over other types of cancer was less. Other varieties found on the posterior third of the tongue included transitional cell carcinoma, adenocarcinoma, muco-epidermoid carcinoma, mucinous adenocarcinoma, lymphosarcoma, lympho-epithelioma and recticulum cell sarcoma.

Syphilis appeared to be a significant predisposing factor only for squamous cell carcinoma arising on the anterior two thirds of the tongue. The decreasing incidence of syphilis in the general population and the increasing tobacco habit in women may account for two discrepancies in the survey, as compared with other reported series. First, the men do not predominate greatly in the incidence of cancer, particularly in the group of persons found to have cancer of the anterior two thirds of the tongue. Secondly, there is a decreased incidence of the lesions in the anterior two thirds of the tongue as compared with the other series. Thus it seems possible that oral hygiene and smoking rather than syphilis are playing a more decisive role in the predisposition to cancer of the tongue.

In this series of 102 patients, all but four received surgery, interstitial radiation or a combination of both as therapy for lingual cancer. Of the remaining four, two were admitted to the hospital in terminal condition and died before definitive treatment could be started; one patient was transferred to a VA hospital, and the fourth patient refused therapy.

The authors believe that the surgical treatment of lingual cancer is most uniformly successful. Without palpable evidence of lymphatic metastasis, the primary tongue tumor can be excised easily with little jeopardy of life or inconvenience to the patient. More extensive dissection is required in the presence of mandibular, cervical or epiglottic involvement. Surgery may be coupled with interstitial implantation of radioactive iridium to obviate the need for occasional operative sacrifice of the common carotid or internal carotid arteries and to sterilize other sites of nonresectable tumor tissue. External irradiation has been employed chiefly as an adjunct to interstitial irradiation.—*Irwin A. Small.*

Announcements

■ X-ray Diagnosis Harmless to Patient, Council Advises

"There is no scientific evidence that the routine use of modern x-ray equipment for dental diagnostic purposes will be harmful to the patient," the Council on Dental Research said in a formal statement released in January.

The statement was prepared in response to inquiries stimulated by recent assertions of some writers and commentators that diagnostic dental roentgenographic examination may be harmful to patients. The statement follows:

"X-ray examinations are essential in the diagnosis of dental disease. The elimination of such examinations would hamper adequate diagnosis and impair proper treatment.

"Many million x-ray examinations have been made annually by dentists without a report of injury to the patient. There is no scientific evidence that the routine use of modern x-ray equipment for dental diagnostic purposes will be harmful to the patient.

"The American Dental Association recommends that all steps be taken to reduce as effectively as possible the amount of patient exposure to radiation by the use of modern equipment such as a long cone, a filter and fast film.

"In view of available scientific reports, the Council on Dental Research of the American Dental Association believes there is no justification for concern by patients undergoing routine x-ray examinations for dental diagnosis."

■ Americans on Program of F.D.I. Rome Congress

A number of prominent American dentists will participate in the scientific program of the International Dental Congress of the Fédération Dentaire Internationale in Rome next September. Among the United States dentists are J. A. Salzmann of New York; George W. Teuscher of Chicago; F. A. Arnold, Jr., of Washington, D. C.; George C. Paffenbarger, also of Washington, D. C., and LeRoy Ennis of Philadelphia.

In addition to an extensive scientific program, a social program including tours to points of interest in Rome is planned.

Tours from this country to Europe are offered by a number of travel agencies. The tours, which range in length from three to nine weeks, will visit Great Britain, The Netherlands, Belgium, Germany, France, Switzerland and Italy. Among those sponsoring tours are the Carrick Travel Bureau, Oberlin Bank Bldg., Oberlin, Ohio; the Howard Tours, Inc., 578 Grand Ave., Oakland 10, Calif., and Lee Kirkland Travel, 1231 Baltimore Ave., Kansas City 5, Mo. Several hundred Association members are expected to attend the Congress.

■ Symposium on Pain Is Feature of American Academy of Dental Medicine Meeting

The eleventh annual meeting of the American Academy of Dental Medicine will be held in Boston May 29 through June 1 at the Hotel Sheraton Plaza. The three-day scientific sessions will be devoted to a symposium on pain. Well-known clinicians will present various aspects of the nature and cause of pain as well as procedures for surgical and nonsurgical management. Details on the program may be obtained from Arthur Gold, chairman, 26 Maple St., Springfield 3, Mass.

■ A Pennsylvania Blue Shield Contract Adds Oral Surgery

Certain oral surgery procedures have been included under the new Blue Shield Plan for some 640,000 Pennsylvania steelworkers and their dependents, according to the November issue of *Pennsylvania Dental Journal*. A number of ancillary services, including the dental benefits, were added when Blue Shield coverage was again selected by the United Steelworkers of America and the steel companies last September.

Oral surgery services included are treatment of diseases and injuries to the jaw and extraction of impacted teeth. The beneficiary must be a patient for 24 hours or for continuous parts of two consecutive days in an accredited hospital. The reduction of fractures and dislocations of the jaw, however, can be performed either in or out of a hospital.

■ Optimal Occlusion in Management of Periodontal Disease Is Berkshire Conference Theme

Attainment of optimal occlusion in the management of periodontal disease is the theme of the Eighth Annual Berkshire Conference in Oral Pathology and Periodontology which will be held at Eastover in Lenox, Mass., June 16-20. The Conference is sponsored by Tufts University School of Dental Medicine.

On the faculty will be Joseph L. Bernier, chief of the branch of Dental and Oral Pathology, Armed Forces Institute of Pathology, Washington, D. C.; Irving Glickman, professor of oral pathology and periodontology, Tufts University School of Dental Medicine, Boston; Herbert I. Margolis, director of the Cleft Palate Institute at Tufts; I. Franklin Miller, general practitioner of New York; W. George F. Schmidt, professor of clinical dentistry, Northwestern University Dental School, Chicago; Joseph P. Weinmann, M.D., head of the division of oral pathology, University of Illinois College of Dentistry, Chicago; Frank M. Wentz, head of the department of periodontics, Loyola University Dental School, Chicago, and Edward V. Zegarelli, head of the department of diagnosis and roentgenology, Columbia University School of Dental and Oral Surgery, New York.

Further information on the Conference may be obtained from Tufts University Dental School, 136 Harrison Ave., Boston 11.

■ 1957 Dental Medicine Case Histories Now Ready

The 1956-57 series of case histories in dental medicine provided by the American Institute of Dental Medicine are now available, the Institute announces. The case histories, sent monthly to subscribers, include 35 mm. Kodachrome slides of an oral disease, laboratory observations, roentgenograms, diagnostic criteria and a discussion of the disease. Additionally, a loose leaf binder and slide box are furnished each participant. During the four years that the Institute has offered this service, 683 one year subscriptions have been provided. Subscriptions may be obtained from Mrs. C. Novembri, Institute secretary, 2240 Channing Way, Berkeley 4, Calif.

■ Hospital Dental Service Institute Set for June

The first institute on hospital dental service to be sponsored by the American Dental Association in cooperation with the American Hospital Association will be held June 17-19 in the Willard Hotel, Washington, D. C., announces Frank B. Hower, chairman of the Council on Hospital Dental Service.

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